*A Scranton Gillette Publication*

SEPTEMBER 1959

# WATER & SEWAGE WORKS

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**COMPLETE INSTRUMENTATION** for todays' water plant is a combination of standard instruments, plus some specially designed equipment. For complete details see page 367.

Iron & Manganese Removal Plant pp. 398

AWWA Report pp. 385

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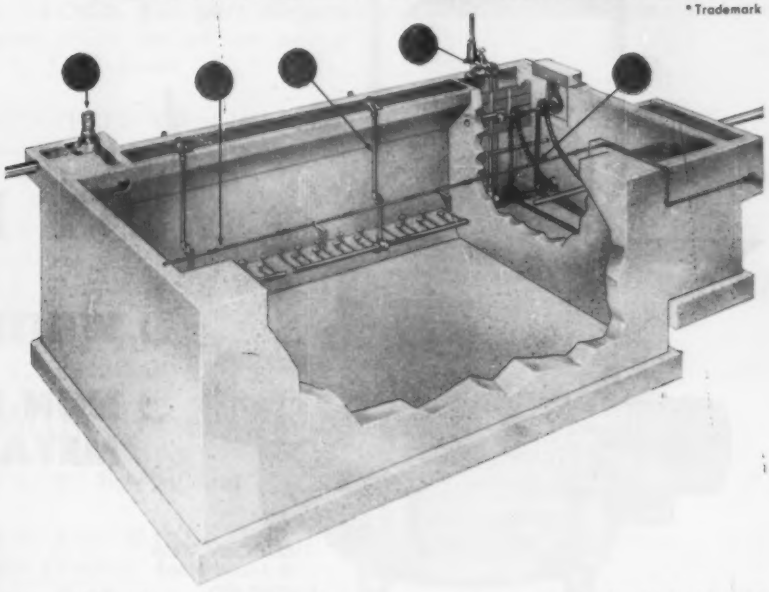

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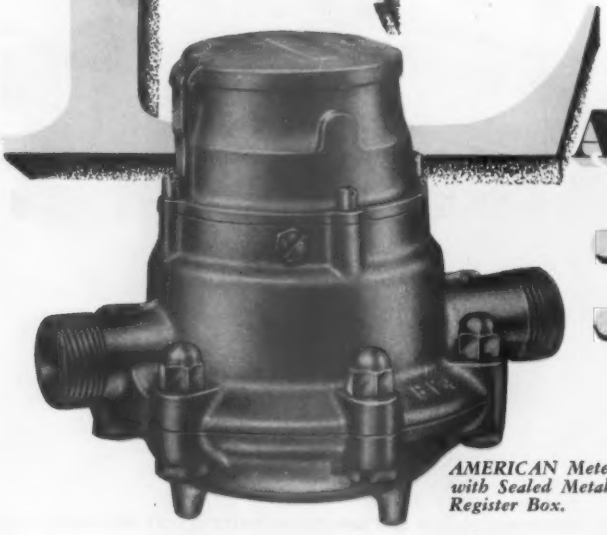

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2909 Main Street
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Vol. 106 No. 9
SEPT. • 1959

A Scranton Gillette Publication

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# WATER & SEWAGE WORKS

**INSTRUMENTATION IN WATER WORKS** *discusses the push button age of water treatment*
*by* **P. L. Voelker** 367

**HISTORY OF HERSEY METER CO.** *or 100 years of metering* 372

**COUPLINGS,** *this part discusses the proper transmission of power from driver to pump*
*by* **I. J. Karassik** 375

**DEWATERED SLUDGE,** *from a treatment plant handling brewery and paper plant wastes*
*by* **W. C. Anderson** 380

**AWWA CONVENTION REPORT**—*Part one of a two part report on the Technical Sessions*
*by* **F. C. Maurer & W. A. Cawley** 385

**CONSTRUCTION**—Part III—*this part covers Pipe Jointing*
*by* **L. J. Ritter** 390

**OXIDATION OF SEWAGE ODORS** *by means of catalytic combustion*
*by* **A. H. Ullrich and R. J. Ruff** 395

**IRON AND MANGANESE REMOVAL** *as practiced at Lake Charles, La.*
*by* **G. West** 398

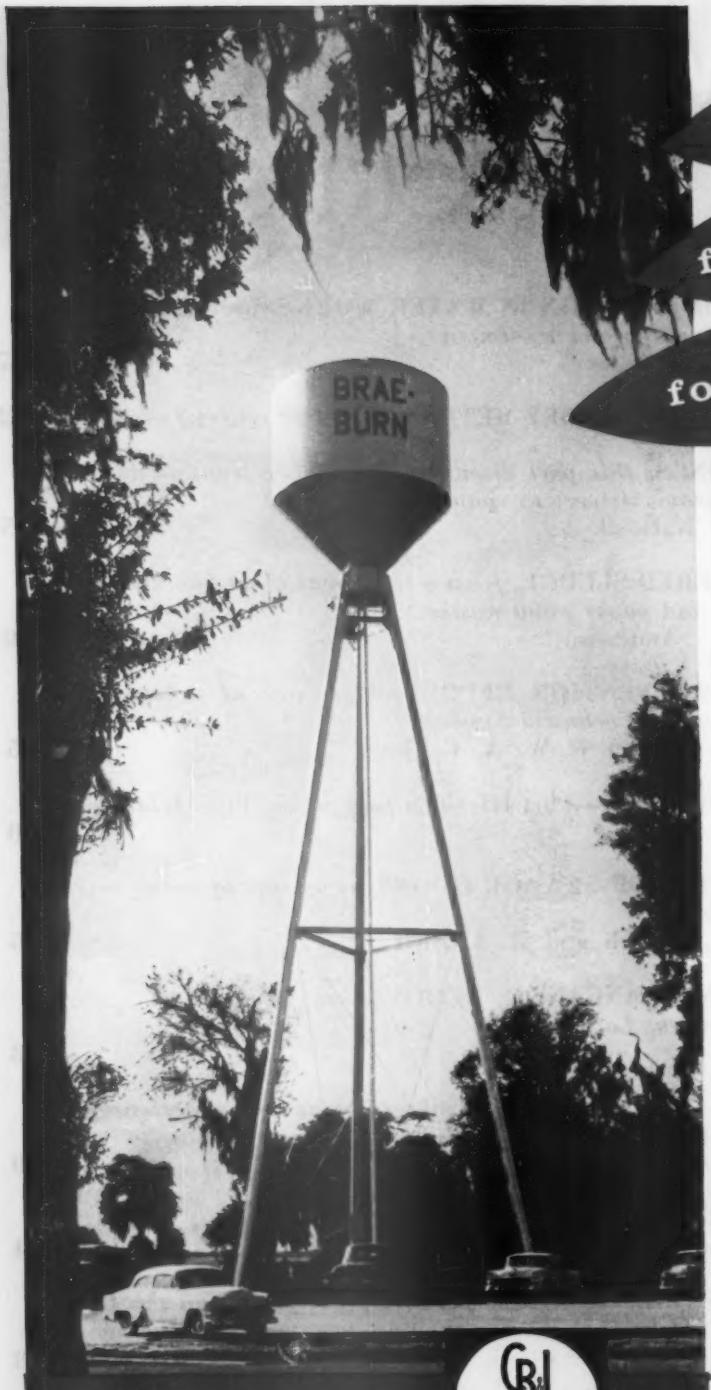
**EUROPEAN TRIP**—*Personal observations and experiences of a trip through Sewage and Industrial Waste plants*
*by* **Don E. Bloodgood** 400

**THE JAR TEST,** *its use in water clarification*
*by* **M. Lane** 404

**NEW SEWAGE TREATMENT PLANT**—*A report on the Ohio Sewage & Industrial Wastes Meeting features centrifuging*
*by* **W. A. Cawley** 408

**DEAR BILL** *asks, How do you keep young employees loyal and reasonably happy?* 410

*News—Here & There* 7A — *Meeting Calendar* 94A
*Equipment News* 13A — *News of Suppliers* 106A
*New Bulletins* 112A

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# Briefs

**Instrumentation in Water Works** presents the latest idea on how instrumentation can be applied to storage, purification and distribution of water—it indicates that the push button water treatment plant is coming—page 367.

**This Year the Hersey Manufacturing Co.** celebrates the completion of 100 years of manufacturing. During 76 of these 100 years the company has been a supplier of meters to the water industry. For the story of this company see page 372.

**Couplings** is the subject discussed in part fourteen of the series on centrifugal pumps—page 375

**Dewatering Sludge** reports the results of many years work to correct problems with a sludge from a sewage containing significant amounts of industrial wastes—page 380.

**The 79th Annual Conference** of the AWWA is reported in part other write ups appeared last month and further coverage is planned—this section features abstracts of some of the papers presented—page 385.

**Handling of Pipe** into the trench and installation of rubber joints are the subjects covered in the third installment of the new series on construction supervision. Written from the practical viewpoint, this series is of usefulness to water and sewage works personnel who have responsibility for construction and major repair work—page 390.

**Oxidation of Sewage Odors** by a catylitic method presents an interesting approach which Austin Texas utilized to solve a problem resulting from stale sewage in a holding tank located in a residential area—page 395.

**Iron and Manganese removal** by treatment directly at the wells was effected by the use of automatic filters, at Lake Charles, La.—page 398.

**The European Trip** last summer of Prof. Don Bloodgood included tours of most of the research facilities and interesting treatment plants in England on the continent. His impressions and descriptions of the trip are on page 400.

**The Jar Test** is the third part of the series on coagulation theory and practice designed to improve understanding of chemical treatment for water clarification. This part concerns itself with the use of the jar test —page 404.

**New Sewage Treatment Works** is the report of the thirty-third annual meeting of the Ohio Sewage and Industrial Waste Conference—page 408.

**Dear Bill** what do you do to keep your young employees happy? Bob presents some suggestions on what he has found to be useful—page 410.

4-D

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# News—Here & There

## Dams for Water Yield Approaching Limit of Use in U.S.

Hydrologists of the Department of the Interior's Geological Survey using probability mathematics in the analysis of U.S. water supply problems have concluded "there is a limit to the practical gains which can be accomplished by building reservoirs on streams, and that limits already may have been reached if not exceeded in some of the western drainage basins."

Survey Circular 409, "Water Yield and Reservoir Storage in the United States" by Walter Langbein, points out that whereas current reservoir storage development in the United States makes regulated use of about 190 million acre-feet of water, (some 13 percent of the total U.S. river flow) future needs "challenge our ingenuity in achieving efficient location of added storage."

Copies of Geological Survey Circular 409 "Water Yield and Reservoir Storage in the United States" by Walter B. Langbein, and Circular 410 "Probability Analysis Applied to a Water-Supply Problem" by Luna B. Leopold, may be obtained free from the U.S. Geological Survey, Washington 25, D. C.

## Michigan to Eliminate Duplicate Water Services

A major development toward the elimination of duplicate services furnished by the city of Detroit and Wayne County will occur when the County sells its separate water systems to the city.

Valued at $60 million, the county system includes existing waterlines worth between $10 and $15 millions, plus a $50 million intake and distribution system now under construction.

Under the plan, the city would operate the county system under a lease arrangement for 30 years. It would take final ownership in 1990, when the county will have paid off bonds outstanding on its system.

In the meantime, the city would finish the $50 million project serving the southwest part of the county by 1964 and spend $14 million to expand service to the northwest part.

## Awards Made to Best Operated Water and Sewage Plants in Florida During 1958-59

Above are shown the Water and Sewage Plant Operators who won awards for the year 1958-59.

First row, left to right: J. M. Logan, Pinellas County Water System; C. M. Courson, City of Tampa Sewage Department; David B. Lee, director of Bureau of Sanitary Engineering, Florida State Board of Health, Jacksonville; Sam P. Robinson, Lake Wales Sewage Dept.; W. C. Tims, Coral Gables Sewage Dept.

Second row, left to right: Paul Samuels, Hileah (Miami) Water Dept.; J.T. Hoffman, Naples Water Department; Perry Cessna, City of Bradenton Sewage Department; Dries Vandenburg, City of Clearwater Sewage Dept.; Thomas E. Wagoner, Al Whitted, St. Petersburgh Sewage Plant; and J. N. Hagerich, Alexander Orr, Jr., Miami Water plant.

Water Treatment Plant Awards went to: Atlantic Beach; Winter Park; Pinellas County Water System; Naples; North Miami Beach; Dual award to City of Miami and Hialeah; U. S. Sugar Corporation; and the Tampa water plant. The above awards are made for different population and type of treatment classifications.

Sewage Treatment Plant Awards: Tampa; Lake Wales; Bradenton; Clearwater; Coral Gables; and International Airport #2.

## Aurnhammer, Jeske & Aurnhammer Open New Office

Aurnhammer, Jeske and Aurnhammer, Consulting Engineers, have announced the opening of their office at 47 River Road, Summit, New Jersey.

Walter L. Aurnhammer of Summit, N. J. has been a practicing Engineer for 30 years specializing in Planning, Design and Supervision of Construction of large scale subdivisions in the Northern New Jersey Area.

John L. Aurnhammer of Hanover Township, N. J., a graduate of Newark College of Engineering has been practicing with his father since 1946 specializing in Municipal Planning Work and development of large residential and industrial tracts.

Richard J. Jeske of North Plainfield, New Jersey, formerly associated with Elson T. Killam, Hydraulic and Sanitary Engineer and practicing in the Sewage, Water, Industrial Wastes and Drainage field since 1949. He is a member of the AWWA, N.J.S&IWA, APHA, Inter-American Assn., and National Society of Professional Engineers.

## Hawaii Creates Groundwater Commission

Hawaii has just passed a law creating a commission on groundwater resources with power to regulate and control the taking and use of water whenever regulation is required in the public interest.

## USPHS Sanitary Engineer Examinations

The United States Public Health Service will hold competitive examinations for Sanitary Engineers as officers in the Regular Corps, throughout the United States on November 17, 18, 19 and 20, 1959.

Appointments provide opportunities for career service in Sanitary Engineering, including research, in the PHS officer grades of Junior Assistant, Assistant, and Senior Assistant Sanitary Engineer, equivalent to

CONTINUED ON PAGE 9A

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# News—Here & There

CONTINUED FROM PAGE 7A

Navy ranks of Ensign, Lieutenant (j.g.) and Lieutenant, respectively.

Application forms may be obtained by writing to the Surgeon General, United States Public Health Service (P), Washington 25, D. C. Completed application forms must be received no later than October 9, 1959.

## Lawson D. (Deac) Matter Retires

Lawson D. (Deac) Matter, chief of the Pennsylvania State Health Department, water supply section has retired after 40 years of service with the department.

Dr. C. L. Wilbar, Jr., State Health Secretary, in accepting Mr. Matter's resignation, extended "sincere appreciation for the many years of service you have rendered the Department." The Secretary added "you have given an unusually long period of dedicated service to the people of Pennsylvania. Your knowledge and trustworthiness in the water supply field have become recognized throughout the state and by a number of national bodies."

Mr. Matter joined the State Health Department on February 26, 1919 as a draftsman in the design and construction section, engineering bureau.

He assisted in the formation of the Pennsylvania Sewage and Industrial Wastes Association, the Pennsylvania Water Works Operators Association, and the Pennsylvania Section, AWWA. He has served as president of all three groups, and for 10 years was secretary and for three years national director of the sewage works association.

At present he is a national director for Pennsylvania in the AWWA, which has presented him with the Fuller Award. He is an original member of the water works operators' voluntary certification board, and board secretary since its 1951 inception.

## Sewer and Water Construction Expected to Reach $1,780 Millions by 1970

In a second revision of a study prepared by the Associated General Contractors of America it is estimated that the construction volume for sewer and water will gradually rise from $1,094 million in 1959 to $1,780 million in 1970.

These volume estimates are of work put in place, converted to 1947-49 prices to represent a rough approximation of projected changes in the physical volume of construction.

## Freese and Nichols Withdraw From Engineering Firm

The Houston engineering firm of Freese, Nichols, Turner and Collie has announced the withdrawal of two Fort Worth members, Simon W. Freese and Marvin C. Nichols.

Nat P. Turner and Robert M. Collie, Houston members of the firm, with the entire staff, will continue their engineering practice under the name of Turner and Collis, Consulting Engineers, Inc. The firm's Port Arthur office, in the Adams Building, will continue to operate without change.

## Delaware Established State Water Resources Commission

A bill to establish a State Water Resources Commission was passed by the Delaware Senate. The measure also would provide for the licensing of commercial water users. Dean George I. Worrilow of the University of Delaware's School of Agriculture said this would provide a guarantee of water rights not now existing under riparian rights.

## N. Carolina House Passes Water Resources Bill

A bill providing for the creation of a new State Department of Water Resources was passed by the North arolina House of Representatives and sent to the State Senate.

The report explained that water functions now carried out by various agencies would be consolidated by the bill under the new department.

These functions include those of the State Conservation and Development Department's Division of Water Resources, Inlets and Coastal Waterways and groundwater research activities of C&D's Division of Mineral Resources.

The State Stream Sanitation Committee also would be transferred to the new department but would retain "exclusive jurisdiction" over stream classification until July 1, 1965.

A seven-member board named by the governor would govern the new department, whose administrative head would be a director.

## California Law Legislation

The voters of California, during the general election in November, 1960, will be asked to approve the issuance of $1,750,000,000 worth of bonds to finance a statewide water development program.

The program will provide a network of dams, canals and other works comparable to the Tennessee Valley Authority and the Central Valleys project.

The key dam on the Feather River near Oreville in Butte County will be the highest dam in the nation, rising 735 feet to top Hoover, Grand Coulee, Chasta and Trinity dams.

The project is designed to transport surplus water from the northern part of the state as far south as San Diego County. Preliminary work has started under legislative appropriations. Available in 1959 is $83 million to speed preparations for the Oreville dam and other features.

Another major provision of the bond act established a $130 million fund for loans and grants to local agencies for construction of independent projects.

Another bill implementing the last provision of the bond issue permits loans up to $4 million for a local project for domestic, municipal, agricultural or industrial purposes if the project conforms to the California Water Plan, and is engineeringly feasible and economically justified.

CONTINUED ON PAGE 11A

# BADGER'S COMPOUND WATER METER ASSURES FULL REVENUE FOR ALL WATER DELIVERED

Wherever water flow rates fluctuate considerably during the day — in schools, factories, hotels, theaters, apartment houses, dairies, laundries — Badger's compound meter assures economical, efficient service.

This compound meter combines Badger's disc and turbine meters to provide accurate registration at all rates of flow. You get the full revenue to which your water department is entitled for water actually delivered.

**It is the industry's only compound meter where only one side operates at a time.** A patented balanced compounding valve directs small streams through the disc meter, large streams through the turbine side... for accurate measurement of all rates of flow, less wear and longer service life.

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# Badger Water Meters

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# News—Here & There

CONTINUED FROM PAGE 9A

## Cast Iron Soil Pipe Standards

The Commodity Standards Div., U. S. Department of Commerce has recently issued a new enlarged edition of the Commercial Standard for cast iron soil pipe.

The new standard, CS188-59, Cast Iron Soil Pipe and Fittings, covers both the extra-heavy weight and the lighter service weight, which were formerly in separate publications. Added items include severlan bends not in previous standards, together with half-Y8s, tapped T's, and regular offsets. Continued substantially without change are requirements for material, testing, dimensions, and weight, as well as means for identifying pipe and fittings that are in accordance with the standard.

Copies of CS188-59 may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C., 30 cents a copy.

## Water Rights—States Rights

The legislatures of thirteen states have recently adopted resolutions asking that Congress safeguard and preserve established state and individual rights to the use of water.

States which have adopted water rights legislation include Alabama, Arkansas, Indiana, Kansas, Nebraska, South Carolina, Tennessee, Texas, West Virginia, and Wyoming.

## The Modification of Weather

"Weather Modification by Artificial Means", was the title of a conference held in Denver, Colo., during the latter part of August.

The Conference, attended by technicians from all parts of the U. S., was sponsored by the American Metorological Society and the American Society of Civil Engineers.

Some of the topics discussed included: Physical Basis of Weather Modification and Scientific Field Testing; Dispersal Systems and Practical Procedures; Evaluation; and Outlook for the Future.

Participants included: Dr. V. J. Schaefer, Schenectady, N. Y.; Dr. Louis J. Battan and Dr. A. R. Kassander, Institute of Atmospheric Physics, University of Arizona; Dr. D. N. Squires, Sidney, Australia; Dr. Theodore Smith, Pasadena, Calif; Robert D. Elliott, Goleta, Calif.; D. M. Fuquay, Missoula, Montana; and Dr. A. S. Dennis, San Jose, Calif.

Rear Admiral Frederic A. Berry; Dr. Horace R. Byers; Dr. Roscoe R. Braham, Jr., and Dr. Arnold Court, evaluated the progress made.

The Outlook for the Future was discussed by Howard T. Orville, San Carols, Calif., former Chairman of the President's Advisory Committee on Weather Control; Robin Reynolds, California Department of Water Resources; and Dr. Ferguson Hall U. S. Weather Bureau, Washington, D. C.

## $171 Billion Needed For Water Resources

The Business and Defense Services Administration, U. S. Department of Commerce, recently announced that about $171 billion will be required in capital investment to develop needed water resources in Continental United States by 1975 to keep abreast of population growth, industrial expansion, and higher living standards.

The report pointed out that the program would mean the expenditure in slightly more than a decade and a half of almost as much as the accumulated value of the investments in these resources and developments since 1790.

The investment in water resources developments is estimated to have grown from about $415 per capita in 1900 to $1,028 per capita in 1958 and is expected to increase to $1,348 per capita by 1975.

The estimates present gradual growth from a total of nearly $33 billion in 1900 to about $151 billion in 1954, $179 billion in 1958; and about $291 billion by the end of 1975. In addition, nearly $60 billion must be expended by 1957 to offset obsolescence and make other replacements.

The above report is titled "Water Resources Developments Capital Investment Values 1900-1975" is for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D.C. Price 10 cents.

## Waste Treatment Research

The Pennsylvania State University is currently conducting research on the "Aerobic Metabolism of Cyanogenic Compounds".

This research is sponsored by the National Institutes of Health and is being performed by and under the supervision of Dr. John B. Nesbitt, Assistant Professor of Civil Engineering at the University.

This project is unique in that an activated sludge culture is being kept alive and growing by using potassium cyanide as the sole source of energy for the microorganisms.

## Ground Water Tracing

A comprehensive report on studies of the application of helium to ground water tracings is now being prepared and will be issued shortly by the Water Resources Center of the University of California.

Investigative work has been conducted in a channel 18 inches deep and 15 feet long, filled with Monterey sand, and having a detention period of 12 hours. The movement of water through the model was followed with helium concentrations ranging from 0.0008 to 1.0 ppm.

The minimum helium concentration which can be detected with the micro-pressure-volume helium analyzer was found to be 0.00043 ppm. Thus the apparatus is capable of detecting 1 part helium in 2.08 billion parts of water. Loss of helium from water flowing through an unconfined porous medium was less than 8 percent of the helium in solution.

## Groundwater Velocity Measurement

Field-scale testing of a continuous well-water sampling device is under way. An investigation of the contamination-dilution technique applied at a single well is planned for late December. It is proposed to contaminate one of a series of observation wells in the pollution-travel well system with a salt solution. Observation of the change in concentration with time will permit estimation of the velocity of groundwater movement according to the theoretical equation. Breakthrough of the tracer at downstream observation wells will be used to verify the theoretical velocity.

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Here's a valve that's as versatile as you want to make it. It can be readily adapted to your piping conditions or process cycles. For example:

**Manual or Automatic Operation** may be used—by means of four-way valves which control the flow of fluid or air to the cylinders.

**Air, Oil or Water** may be used for the operating media—and can be piped from the lines on which the valves are installed.

**Engineered for Your Application**—Valves can be supplied, piped and equipped with solenoid or pilot-operated control valves, limit switches and positioners for remote or local operation.

Write for detailed information or quotes, giving size of valves required, kind of valves (Iron Body Bronze Mounted, All-Iron, Bronze, Special Alloy, etc.), service conditions, maximum disc pressure and minimum cylinder pressure.

DARLING VALVES

**DARLING VALVE & MANUFACTURING CO.**

Williamsport 11, Pa.

*Manufactured in Canada by Canada Valve & Hydrant Co., Ltd., Brantford, Ont.*

# Equipment News

## Electronic Bacterial Colony Counter

901

New Brunswick Scientific Co. Inc., New Brunswick, N. J., has developed a new instrument that enables bacterial colonies to be counted and marked simultaneously in a single probing action.

This illuminated Electronic Colony Counter records pathogenic and non-pathogenic colonies with great accuracy and provides the operator with four different electric counting devices: An Electronic Marking Probe, Electric Marking Pen, Fixed Pushbutton Counter and a Remote, hand-held Pushbutton Counter.

On contact with any agar medium the sensitive Marking Probe actuates a counting mechanism as it makes an identifying puncture in the colony. This probing is simple, fast and accurate. Duplicate counting is avoided, even in densely populated plates.

The self-activating Marking Pen is used where puncturing is not feasible. Slight pressure on the point triggers the counting mechanism and leaves a small ink spot on the glass or plastic plate. The ink is easily washed off.

Specially designed fluorescent lighting floods the culture plate with soft, cool, diffuse light, illuminating specimens with extreme clarity. Even pinpoint colonies are accentuated.

For sparsely populated plates, two pushbutton counting devices are available: a fixed button, conveniently mounted on the cabinet, and a remote, hand-held button accessory for extensive counting. All four counting devices actuate a single, four-digit, electromagnetic counting mechanism which can be cleared automatically with the flick of a switch.

## Outside Meter Box

902

Handley-Brown Company, Jackson, Michigan has developed a new water meter box that installs next to basement foundations to provide outside reading and servicing of water meters.

Called the Meterminder, the box is inexpensive, simple and quick to install, makes meter reading and servicing easy and protects meter and yoke from mechanical damage. The Meterminder makes it unnecessary to enter customers's home and eliminates all meter reading call backs.

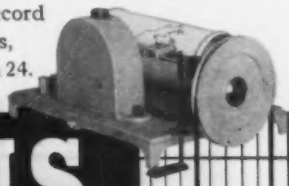
Installation is made through the foundation with top of box at grade level and open end facing the base-

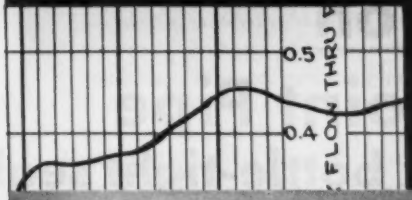
CONTINUED ON PAGE 17A

NOW
LOW-COST AUTOMATIC FLOW RECORDING

*Directly Readable Flow Charts*

Obtain graphic records of liquid flow directly readable in million gallons per day or gallons per minute over various sizes of Parshall flumes. The same recorder can also be used with charts reading in feet and hundredths to record head or surface fluctuations in lakes, streams, wells. Write for free Bulletin 24.






STEVENS
TYPE F RECORDER

...For Measuring Sewage, Industrial Waste and Other Flows

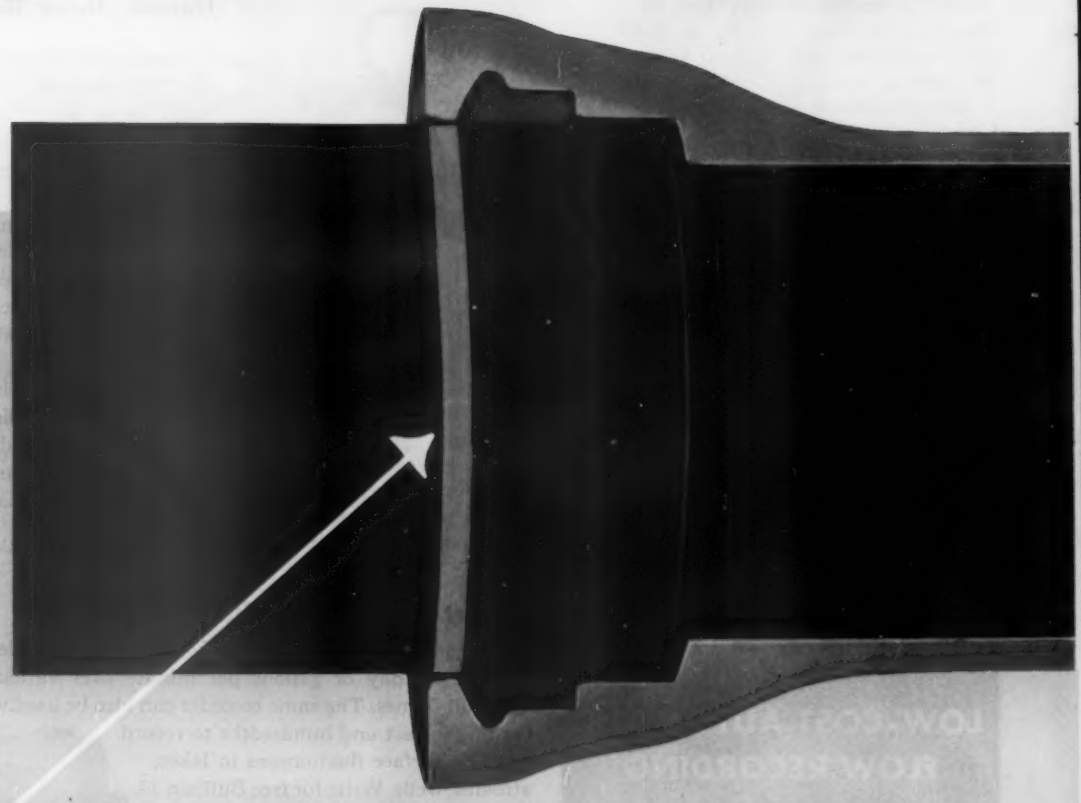
*The planning and efficient operation* of any project which involves measurements of flowing liquids is based on flow data which can be obtained with STEVENS Recorders. These instruments are at work compiling data on hydroelectric and flood control projects and in water works, sewage disposal plants, irrigation and industrial installations in all parts of the world.

**Experienced technical staff available to supply product information for liquid measurement installations. Write, giving description of project and scope of data desired.**

*HYDROGRAPHIC DATA BOOK*
**invaluable for your reference file**
124 pages of technical data on recorder installations, plus a wealth of hydraulic tables and conversion tables. $1 copy. (No COD's.)

**LEUPOLD & STEVENS INSTRUMENTS, INC.**
**4445 N. E. GLISAN STREET • PORTLAND 13, OREGON**
*specialists in hydrologic instruments for over half a century*

# CLOW



## This YELLOW STRIPE on

## CLOW Bell-Tite Joint Pipe

### is your guide line to a quick bottle-tight seal

This circular yellow stripe is painted on the plain end of each length of CLOW Bell-Tite Joint pipe. It serves as a guide in making up the joint, to provide a fast, positive visual check that the the joint is completely and correctly assembled.

The edge of the stripe farthest from the plain end measures approximately one-half inch less than the depth of the Bell-Tite bell. Thus, in assembly, the joint is made pressure-tight when the stripe is no longer visible.

The seal is achieved by the use of a single, thick-section, high durometer molded rubber gasket. When compressed in position by the entering plain end of pipe, it forms a pressure-tight seal with generous sealing area which permits ample deflection to meet casual curves or grades.

CAST IRON

# PIPE

with patented* Bell-Tite Joint

*Patent No. 2898131

# MORE MAIN FOR YOUR MONEY

## Costs less to buy

Only one accessory is required to make a pressure-tight seal with a CLOW Bell-Tite Joint —a single, molded rubber gasket. There are no extras—no bolts, no nuts, no followers, no couplings. This economical pipe is strong, tough, uniform and durable for long-life underground service. It is available in any specified thickness or weight class in accordance with ASA, AWWA, or Federal specifications from 3" to 24".

## Costs less to install

Assembly is quick, simple and easy. Pressure-tight joint is formed instantly by merely inserting the rubber gasket and pushing the pipe home to its seat. It can be installed in a wet trench and even under water. Rate of installation usually is limited only by speed of excavation. It permits ample deflection for casual curves or grades. Bell-Tite Joint pipe is Underwriters' Listed for working pressures up to 350 psi. Available in diameters up to 24".

CLOW CAST IRON PIPE

**JAMES B. CLOW & SONS, INC.**

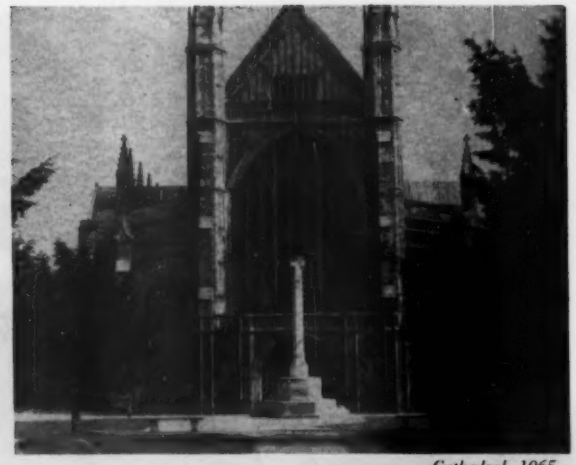
201-299 North Talman Avenue, Chicago 80, Illinois

*Subsidiaries:*

Eddy Valve Company
Waterford, N.Y.

Iowa Valve Company
Oskaloosa, Iowa

*Aqueduct, 105 B. C.*



*Cathedral, 1065*

*Fountain, 1650*

*Ludlow Hydrant, 1883*

SO WELL-MADE

# they're still in use!

In a sense, Ludlow and Rensselaer fire hydrants are among the great man-made objects. They're built to *last*. All Ludlow and Rensselaer hydrants are made to stay on the job through years of rough treatment and rigorous climate —never quitting!

Developed through nearly 100 years of practical experience, Ludlow and Rensselaer hydrants have *earned* their title of "watchdogs of American property." Without exception, they give you the 4 basic requirements for hydrant performance: simplicity of design, absolutely tight closure, no freezing and no flooding due to standpipe breakage.

**WRITE TODAY** for L&R Fire Hydrant Catalogs showing a model for every need.

LUDLOW & RENSSELAER
VALVES AND HYDRANTS

THE LUDLOW VALVE MANUFACTURING CO., INC., TROY, N.Y.—SINCE 1861

# Equipment News

CONTINUED FROM PAGE 13A

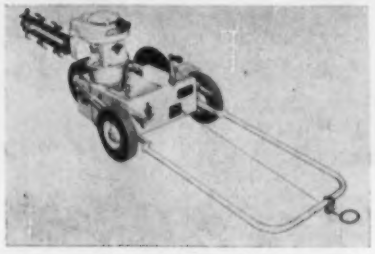
ment. Meter and yoke are kept from freezing by natural circulation of basement heat through the meter and normal heat loss through the basement foundation. Winter tests have shown that sufficient heat is circulated through the Meterminder to keep snow and ice off the top cover.

A Meterminder installation provides the home owner with a separate inside shut off and the water department with a shut off at the meter. Three models are currently available to accommodate 5/8"; 3/4"; 5/8" x 3/4"; and 1" meters. Meterminders are furnished complete with special copper yoke assembly incorporating a stock service value.

### Self-Propelled Trencher

903

Davis Mfg. Inc., Wichita, Kansas, has developed the Davis Pup—a new portable, self-propelled utility trencher. It is especially designed to prepare ditches for gas and water pipe, electric and telephone line installations, or for sprinking systems.



The unit trenches from 2-inches to 3-inches wide and down to depths of 3-feet. Once it has started trenching no operator is needed except for casual observation and to stop the unit.

It has a positive, variable speed drive with a unique winching mechanism that draws the Pup down the line to be dug. Six different speed settings as well as a neutral and stop-forward motion are controlled by a single lever. It will attain speeds up to 400 feet per hour.

A convenient, screw-type self-locking depth control crank lets the operator adjust to the desired depth. A depth control gauge provides visual references for proper setting.

CONTINUED ON PAGE 19A


Costly waste, 20 gallons of water per minute

BEFORE

STOPPED with WATERPLUG Hydraulic Cement

Waterplug stops running water INSTANTLY!

AFTER

*Here is what Underwater Services, Valley Station, Ky., had to say about Waterplug*

On October 6, 1957, our Underwater Services Company was called upon to repair a major break in an underwater drainage system for the Hardin County Sportsmen's Lake at Elizabethtown, Kentucky. Upon diving to the bottom of the lake we discovered several large ruptures in the 24" tiles used in the drainage system. Water, uncontrolled, was pouring through these breaks at a minimum approximate rate of 20 gallons per minute. Using underwater diving equipment we managed to reduce this torrent by packing sandbags into the holes channeled through the four feet of earth covering these tiles. Descending through a water control tower, we gained access to the interior of the drainage tiles to the area of break-through. Above us were four feet of lake bottom and 20 feet of water above that. Under these extremely adverse conditions we used the Thoro System WATERPLUG Cement to repair the breaks from the interior of the tiles.

Because of the simplicity and ease of mixing and applying WATERPLUG Cement, we were able to completely and effectively repair these breaks in the drainage system.

We were delighted with the effectiveness of WATERPLUG Cement in successfully overcoming this difficult water repair problem. Feel confident that in future underwater repair problems, our company will rely upon WATERPLUG Cement.

*"How to do it"* GET OUR 16 PAGE BROCHURE

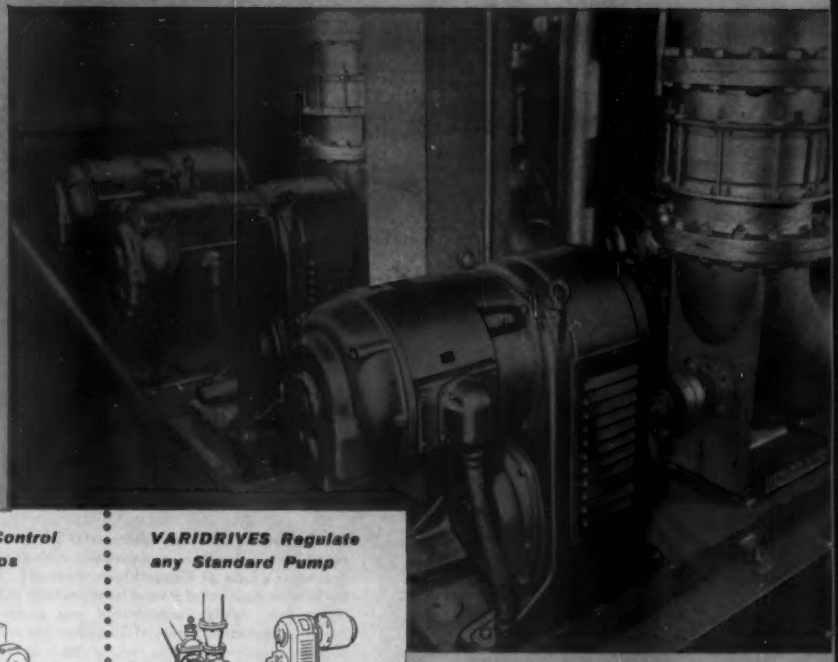
STANDARD DRY WALL PRODUCTS, INC.
NEW EAGLE, PENNA. CENTERVILLE, IND.

VARIABLE SPEEDS FOR VARYING NEEDS

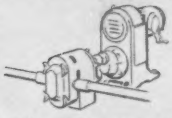
# Control Pumping with U. S. VARIDRIVES

## Regulating the High and Low of Sewage Flow with U.S. VARIDRIVES

Thirty-two 20 h.p. U. S. Varidrive motors like these shown increase or decrease necessary pumping action of axial flow pumps which transfer sewage at the new Hyperion Sewage Disposal Plant of the City of Los Angeles. This is another example of the versatility of U. S. Varidrive motors to handle variable speed pumping problems in all types of industry. Varidrives are available from ¼ to 75 h.p. Speeds 2 to 10,000 rpm.



**VARIDRIVES Power Pumps used for Pumping Beverages**

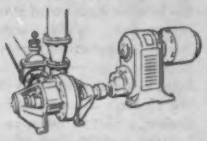


High pressure, low volume rotary positive displacement pumps used in food plants have a variety of uses with the help of variable speed.

**VARIDRIVES Control Metering Pumps**

Piston type, positive displacement pumps used for proportioning or metering liquids are often regulated by Varidrives.

**VARIDRIVES Regulate any Standard Pump**



Centrifugal pumps are made more versatile in handling many different pumping conditions with variable-speed drives.

**Versatile VARIDRIVE for Additional Applications**

- CONVEYORS
- PUNCH PRESSES
- LATHES
- EXTRUDERS
- PACKAGING
- SPOOLING
- MIXING & BLENDING
- CANNING
- GRINDING
- VENTILATION
- BUFFING

**U.S. Electrical MOTORS**

**U. S. Electrical Motors Inc.**
P. O. Box 2058, Los Angeles 54, Calif. or Milford, Conn.
☐ Send U. S. Varidrive Bulletin #1797

NAME_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE____ STATE____

MAIL COUPON NOW

# Equipment News

CONTINUED FROM PAGE 17A

## Pump Tank Combination Chemical Feeding

904

B-I-F Industries, Inc., Providence, R. I., has developed a new, compact and low cost Pump-Tank Combo with Proportioneers Model 1106 Adjust-O-Feeder for accurate and efficient general chemical feeding.

The Pump-and-Tank-Combination is designed to use a minimum of space. The 55 gallon steel support drum containing the molded Polyethylene tank for the chemicals is mounted atop a three-legged angle iron frame. The pump, with its strainer, fittings and hoses is mounted

on cross members of the frame. The entire unit stands only 53" high. The tank, fittings and tubing are made of all corrosion-resistant materials suitable for handling most industrial chemicals.

## 20 MGD Microstraining Installation

905

Glenfield & Kennedy, Inc., New Rochelle, N.Y., has announced that the San Gabriel Valley Water Co., is going to install three 10 x 10 Microstrainer units to handle a total flow of 20 mgd.

Pilot tests, conducted by Engineering-Science, Inc., Consulting Engineers, Pasadena, Calif., on the Fontana water supply indicated that high proportions of the suspended organic matter and of the plankton were re-

CONTINUED ON PAGE 21A

This air view of the City of Tacoma, Washington shows a portion of the industrial area in the foreground with the business district and Commencement Bay in the background. The detail illustration at right, shows a typical cluster of Crispin Air Valves in a Tacoma installation.

"...installed in 1913
...good for another 45 years..."

*from Tacoma comes your proof that*
Crispin AIR VALVES *are dependable!*

Here is your *advance* proof that Crispin Air Valves will give you dependable service *for years*. Mr. J. A. Kuehl, Superintendent of the Water Division, Department of Public Utilities, City of Tacoma, Washington puts it this way . . .

"It may be of interest to you to know that the City of Tacoma, Department of Public Utilities, Water Division, has been using Crispin Air Valves on its 40 miles of supply line since its inception during the year 1913. Maintenance on these valves has amounted to the replacement of seats and floats occasionally and they appear to be good for another 45 years of service."

Crispin Air Valves have these important advantages—simplified construction, easy accessibility, maximum durability, minimum maintenance and thoroughly efficient operation. The records of the City of Tacoma prove the value of these advantages.

We invite you to write, wire or phone our offices for detailed information on dependable Crispin Air Valves . . . your inquiry will receive prompt attention.

AIR CONTROL VALVES • FOR OVER 45 YEARS

multiplex
MANUFACTURING COMPANY
BERWICK, PENNSYLVANIA
Dept. B

**THE ONLY**
**SLUDGE DIGESTION SYSTEM**
**PROVIDING**
**HIGH SOLIDS LOADING...**
**verified performance...**
**maximum operating flexibility**

Accelerated
**CRP**
Sludge Digestion
System
*Trademark

**47** operating and specified installations of the CRP* System with "Chicago" gas mixing equipment, since 1953, prove its unparalleled acceptance . . . serving cities from 2,000 to 250,000 population.

**Savings**

1. A 2/3 reduction in new tank volume requirements.
2. Simplified plant operation due to sludge homogeneity through continuous gas mixing.

**Performance**

1. Produces required biological reduction of solids in 1/3 to 1/7 tank capacity.
2. Maximum quantity of gas produced at higher rates.
3. Complete absence of digester scum through continuous gas mixing.

**INFORMATION IS AVAILABLE** to Consulting Engineers from Chicago Pump Company or its Distributors . . . pertaining to the application of this system and availability of licenses for its use in existing or new digesters designed for present or future maximum digester loadings.

©1959 — CPCo. — FMC

20 ft. dia. digester serving 6000 population . . . Redeo, California . . . Engineer—M. Carleton Yoder

*Putting Ideas to Work*

FOOD MACHINERY AND CHEMICAL CORPORATION

**Chicago Pump Company**

DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

1959 50 YEARS CHICAGO PUMP COMPANY 1909

# Equipment News

CONTINUED FROM PAGE 19A

moved by the strainer with consequent reductions in turbidity to 2 ppm. The species of plankton most commonly encountered were: Navicula, Fragilaria, Cymbella and Oocystis.

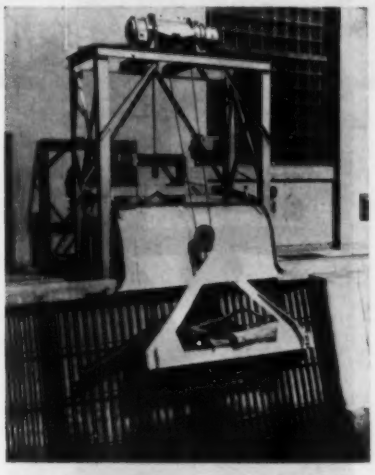
According to the company, the Microstraining installation would have low initial cost, and low operating costs.

## Trash Rack Rake

906

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has developed a new trash rack rake, which helps reduce head and power losses resulting from clogged water intakes. Called the Leonard trash rake, the device is used to remove leaves, grass, roots, branches, and other materials from trash racks that protect water intakes at power, sewage and water supply plants.

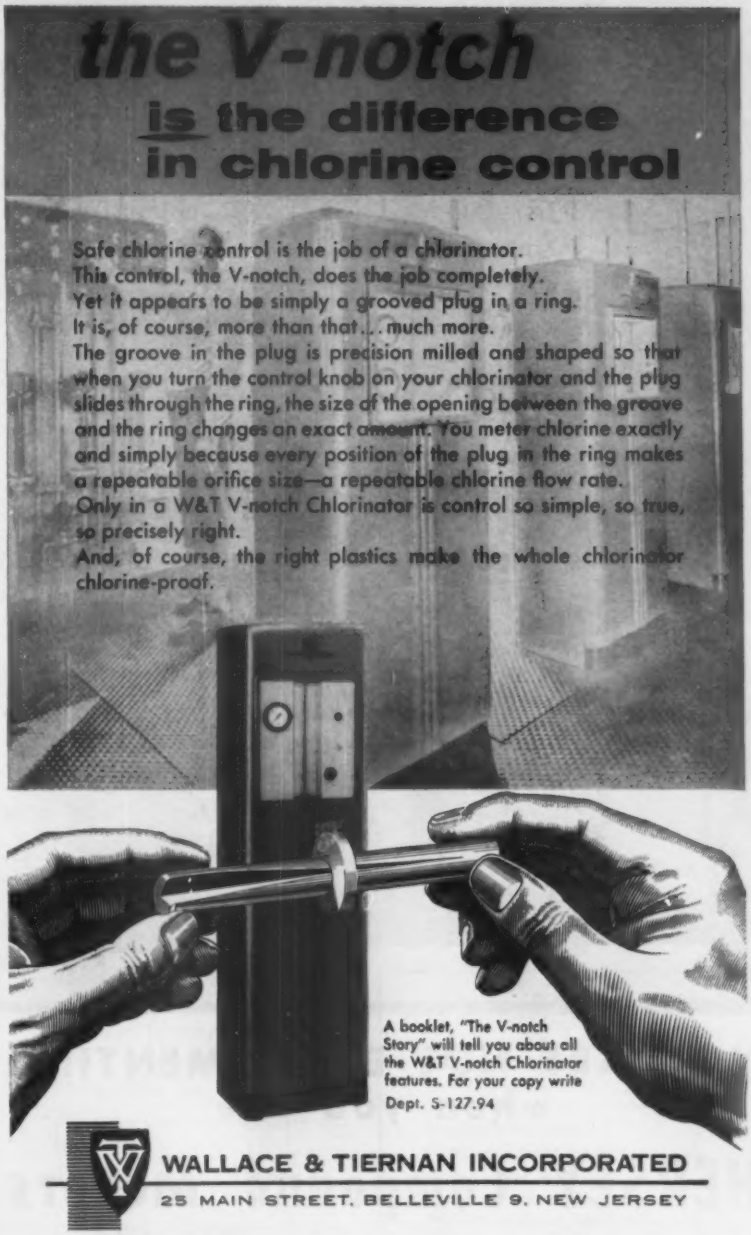
The rake is used on all kinds of stationary intake rack structures which have either inclined or vertical



rack bars. One of its outstanding characteristics is its ability to ride down over stubborn obstructions and work them free. Easy cleaning of the bars is possible because no guides at the rack bars are needed.

An electric hoist raises and lowers the rake. When descending, the rake's teeth automatically turn upward par-

CONTINUED ON PAGE 23A



the V-notch
is the difference
in chlorine control
Safe chlorine control is the job of a chlorinator.
This control, the V-notch, does the job completely.
Yet it appears to be simply a grooved plug in a ring.
It is, of course, more than that... much more.
The groove in the plug is precision milled and shaped so that when you turn the control knob on your chlorinator and the plug slides through the ring, the size of the opening between the groove and the ring changes an exact amount. You meter chlorine exactly and simply because every position of the plug in the ring makes a repeatable orifice size—a repeatable chlorine flow rate.
Only in a W&T V-notch Chlorinator is control so simple, so true, so precisely right.
And, of course, the right plastics make the whole chlorinator chlorine-proof.
A booklet, "The V-notch Story" will tell you about all the W&T V-notch Chlorinator features. For your copy write Dept. S-127.94
WALLACE & TIERNAN INCORPORATED
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

**is your feeding problem peculiar to your operation?**

Wallace and Tiernan's volumetric feeders are so flexible that each job is practically custom built. W&T's experience is broad enough to meet any challenge.

*Try us - for information write Dept. MV-1.94*

WALLACE & TIERNAN INCORPORATED

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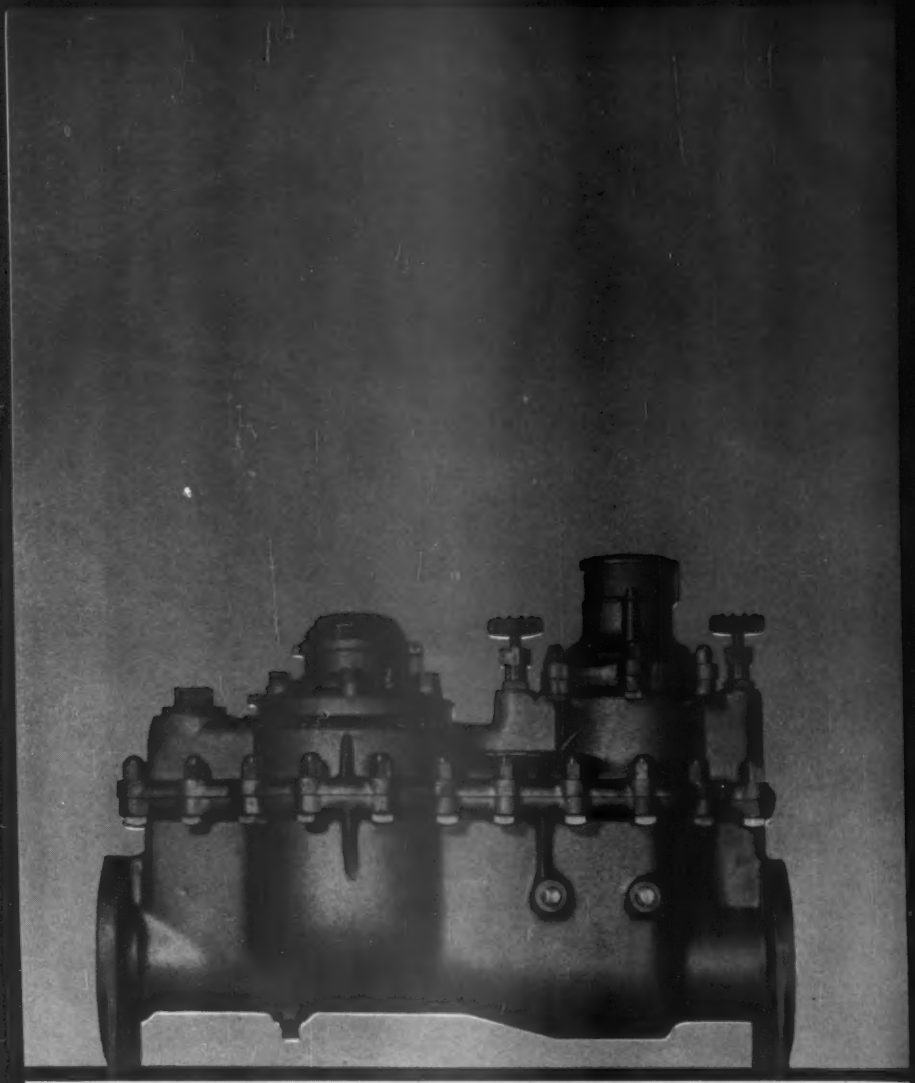


# HERSEY

**YOU ARE NOT EXPERIMENTING**
**when you use**

## HERSEY Compound Meters

All Bronze Case 2" to 6" Inclusive

**Time has proven them the best for the accurate registration of all rates of flow**

*YOU CAN'T BUY A BETTER WATER METER THAN HERSEY*

## HERSEY MANUFACTURING COMPANY

(Established 1859)

**DEDHAM, MASS.**

**BRANCH OFFICES: NEW YORK — PORTLAND, ORE. — PHILADELPHIA — ATLANTA — DALLAS**
**CHICAGO — SAN FRANCISCO — LOS ANGELES**

HERSEY 1859 1959 100 YEARS OF PROGRESS

# Equipment News

CONTINUED FROM PAGE 21A

allel with the rack bars to clear debris. When ascending, the teeth tilt to a position perpendicular to the racks and penetrate between them to carry the debris to the unloading position. Removal of floating trash is speeded as the rake teeth rotate to the proper raking position.

### Remote Meter-Reading System
907

Buffalo Meter Company, Inc., Buffalo, N.Y., has developed a remote meter-reading system that permits readings of water meters to be taken at any point remote from the meter itself. The usual installation will be to place the meter wherever convenient on the water pipeline inside a residence, and read the meter from outside the building. The exclusive design of the Telereader unit permits this to be done for the first time with absolutely no mechanical load on the meter works, no interference with meter accuracy or length of life.

The American Meter with Teleread register has a round reading register mounted on the meter body in the customary way. On the shafts of this register which indicate 1000 or more gallons of water, are mounted precision-built potentionmeters. These are wired through a flexible water-proof cable to a plug located on the outside of the house and mounted in a shielded enclosure.

To read the meter outside the house, the meter-reader carries with him a compact light-weight readout mechanism which is about the size and weight of a flashlight. The end of this is inserted into the plug on the outside of the house. Current from the semi-permanent battery in the readout unit travels through the cable to the potentiometers causing the position of the dial hands on the meter to be indicated on scales located on the readout unit. After noting the meter-reading, the readout is removed from the outlet and the indications on the readout scales return to zero. While the portion of the unit that is

CONTINUED ON PAGE 25A

"The Cleveland J-30 doubled my daily production on 100,000 feet of trench"

HOWARD ZACHARIAS OF WELLINGTON, OHIO, a drainage contractor for the last 18 years, has averaged 2,500 feet per day with his new Cleveland J-30, has done 3,500 feet in 7½ hours, compared to an average 1,000 feet per day with other makes he formerly used. He did 100,000 feet of tiling with his J-30 between January 5 and May 1, in spite of adverse weather more than half the time.

He gives special credit to the J-30's beautiful balance and low ground bearing pressure on its long full crawlers, its easy-rolling 1,000-hour-lubricated track, the big capacity of its independent-drive conveyor, and the "push-button" hydraulic conveyor shift, which he says is particularly useful on tie-ins.

ITS FEATURES TELL WHY

- The world's finest trencher crawlers, 1,000-hour-lubricated, a tremendously long lived, trouble-free, easy-rolling track with big 16" x 3" hydraulic steering brakes.
- V conveyor provides constant elevating angle for faster, higher spoil discharge, with dual independent hydraulic drive and automatic hydraulic shifting.
- The finest, most practical tiling and gumbo equipment.
- Complete visibility and control of every operation at the operator's seat.

The CLEVELAND TRENCHER Co.

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

Good Everywhere

# CARE

## makes the difference in Pennsalt® Chlorine

**care** *in manufacturing*... Pennsalt® Water Works Grade Chlorine gets *extra* purification to insure absolute adherence to water works standards.

**care** *in handling*... Pennsalt Water Works Grade Chlorine is made, packaged, and shipped only under Pennsalt supervision, to eliminate any chance of contamination.

**care** *in packaging*... Containers for Pennsalt Water Works Grade Chlorine are cleaned and inspected before each use, with every precaution taken to eliminate foreign matter that could foul your chlorinators.

Important, too, is Pennsalt's care in planning that assures you ample supply when your needs grow. Pennsalt Water Works Grade Chlorine is available in 100- and 150-lb. cylinders; in one-ton containers and in multiple-unit rail cars. Call or write Pennsalt today for fast service.

*For faster sedimentation, higher efficiency, in your sewage plant... use Pennsalt® Ferric Chloride, anhydrous or liquid.*

**See our Catalog in CMC**

INDUSTRIAL CHEMICALS DIVISION

**PENNSALT CHEMICALS CORPORATION**

3 Penn Center, Philadelphia 2, Pa.

Chicago • Detroit • New York • Philadelphia • Pittsburgh • St. Louis • Appleton • Atlanta
Airco Company International, New York • Pennsalt Chemicals of Canada Ltd., Oakville, Ontario

**Pennsalt Chemicals**
ESTABLISHED 1850

In the West, Pennsalt inorganic chemicals are available through Pennsalt of Washington Division, with plants at Tacoma, Washington and Portland, Oregon.

# Equipment News

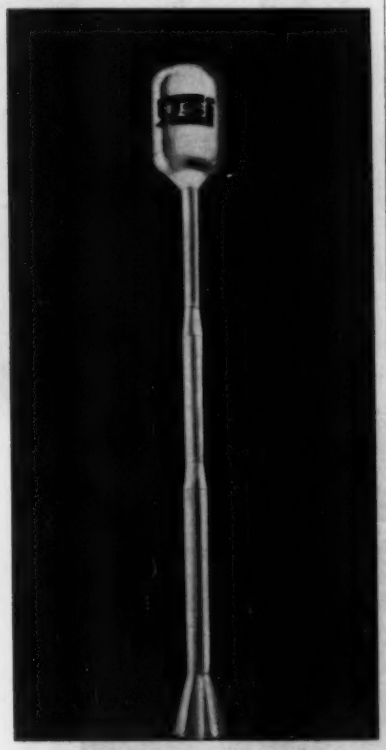
CONTINUED FROM PAGE 23A

inside the meter register is not affected by moisture, the entire register is mounted in the American sealed metal register box unit keeping it perfectly free from dust or moisture of all kinds.

### New Water Tower

908

Solar Chicago, division of U. S. Industries, Inc., Chicago, Ill., has developed a new water tower called the Aquatower. The Aquatower is an addition to Solar Chicago's line



of stand pipes and water reservoir equipment. It has been designed as a single column, free from external supports and bracing. The design of the tank affords a straight vertical surface which provides a lofty billboard for company and civic names or trademarks.

The Aquatower has features inherent in its design which makes it possible to effect certain economies in construction and pass them on to

CONTINUED ON PAGE 29A


## ROLLAND SIMPLIFIES WATER QUALITY CONTROL

View of the exterior of the new Rolland Paper Company water treating plant, designed to purify 4,000,000 gallons of water a day, and housing a Hardinge Automatic Backwash Sand Filter.

The Rolland Paper Company, Limited, of St. Jerome, Quebec, is located in the Laurentian district of Canada, a vacation land visited by many who enjoy the natural beauties of the country, the excellent cuisine, and good sports.

As a manufacturer of fine papers, including rag, rag content and sulphite bond, ledger, writing, and specialties, the Rolland Company is particularly interested in maintaining and improving the high quality of their papers. New techniques and machines are continuously being added.

One of the most recent acquisitions has been a Hardinge Automatic Backwash Sand Filter, plus Flocculation Units, all combined to give them a complete water treatment plant for controlling the quality of their process water.

With good water continuously available as a basic ingredient for their process, product quality control is simplified. The vagaries of nature, bringing sudden storms to muddy-up raw water sources, are once again only a natural phenomenon, a joy to the farmer, and a prelude to rainbows.

Driving mechanism for one of two Hardinge Flocculating Units which precede the ABW Filter.

General view of the Rolland Paper Company water treatment plant interior showing the 12½' x 76' Hardinge Automatic Backwash Sand Filter. The backwash mechanism travels from end to end of the filter tank along tracks on the sidewalls.

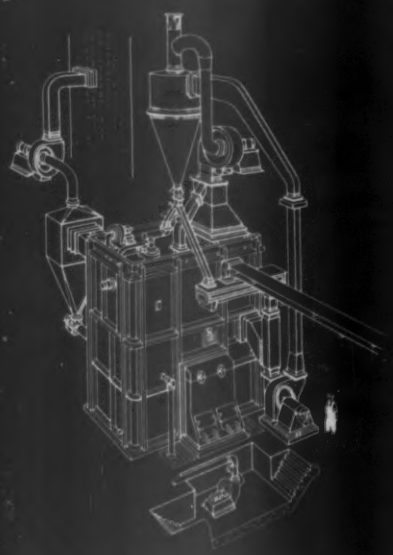
HARDINGE
COMPANY, INCORPORATED

YORK, PENNSYLVANIA • 240 ARCH ST. • Main Office and Works

New York • Toronto • Chicago • Hibbing • Houston • Salt Lake City • San Francisco • Birmingham • Jacksonville Beach

# WASTE DISPOSAL HAS COST RECOVERY POSSIBILITIES

*Why not explore them for your community?*



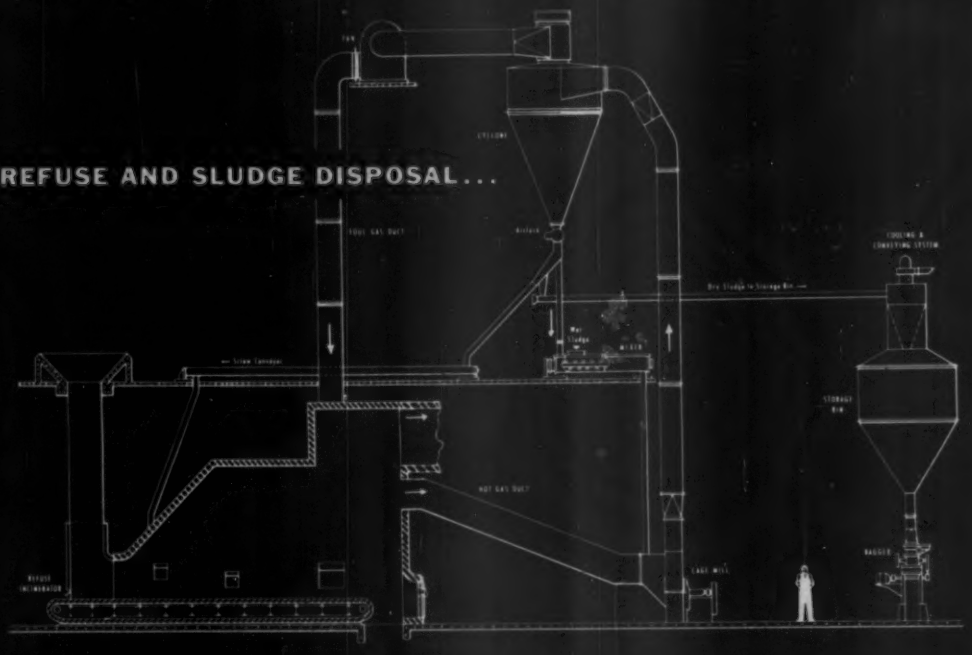
**FOR SLUDGE DISPOSAL...**

THE C-E RAYMOND FLASH DRYING AND INCINERATION SYSTEM

is the **only** system that permits both drying and incineration of sewage sludge – separately or together – in any proportion. This service-proved equipment today processes more filter cake than all other systems combined. High temperature deodorization and efficient fly ash collecting equipment assure that nearby residents are not bothered by air pollution. The C-E Raymond System's unique design and **control** also assure economy of operation and uniformity of product.

**ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS;**

## FOR REFUSE AND SLUDGE DISPOSAL...



THE C-E INCINERATOR STOKER AND THE C-E RAYMOND SYSTEM

combine a half-century of experience in burning all kinds of conventional, marginal and waste fuels with the most service-proved drying system. Using "continuous" processing, the C-E Incinerator Stoker requires only minimum operating attention and maintenance. From the time refuse is fed into the self-sealing, non-clogging hopper, until the incinerated residue is discharged to the ash pit to be hauled away, the entire operation is automatic, efficient, quick and clean. The C-E Incinerator Stoker is capable of burning all types of combustible refuse in quantities ranging upward from 50 tons per 24-hour day. Heat from the burning refuse is used by the C-E Raymond Flash Dryer System to dry sewage sludge.

**Yes, even waste disposal can be turned into a *productive* function. Municipalities all over the country find new economies . . . new revenues . . . through their use of Combustion units like those shown on these pages. With continuous, near-automatic processing, substantial manpower can be diverted to other duties . . . capacity per dollar of investment is increased . . . usable and marketable end-products are produced.**

**Many communities turn sewage sludge into a desirable, humus-rich soil conditioner** with the C-E Raymond Flash Drying and Incineration System. Often, they can recover a large part of their operating expenses from sale of this conditioner or use it to maintain parks and recreation areas. Other towns use units of the same design to incinerate sludge to sterile ash. These versatile units can produce one or both end-products in any proportion.

**For refuse incineration,** the C-E Traveling Grate Incinerator Stoker is available. It reduces garbage and refuse to a sterile ash, free from clinkers. The ash is suitable for use as a sanitary land fill for the reclamation of waste land. Where required, the incinerator may be used in conjunction with a C-E Waste Heat Boiler to provide an economical steam source for plant heating or power.

**To make the most of existing property,** economy-minded municipalities are looking more and more into the possibility of *treating both refuse and sewage sludge* at the same plant site. Aside from the obvious benefit of lower capital investment, there's the added benefit of being able to combine both manpower and equipment, eliminating costly duplication. In addition, the C-E Refuse Incinerator can readily supply *no-cost heat* to dry sewage sludge.

# COMBUSTION ENGINEERING

C-E

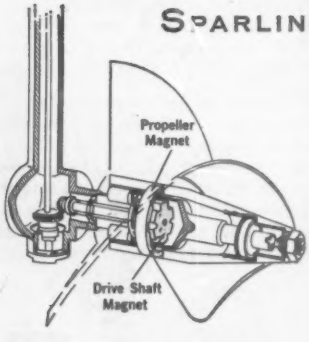
C-215

**Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.**
**Raymond Division: 1132 West Blackhawk Street, Chicago 22, Ill. • Western Office: 510 West Sixth Street, Los Angeles 14, Calif.**
**Canada: Combustion Engineering-Superheater Ltd.**

PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

# TOTALIZATION *and* RATE OF FLOW *at a glance*

## SPARLING MASTERFLO MAIN-LINE METERS




**DIRECT TOTALIZATION** is the primary function of all Sparling Meters. The SPARLING MASTERFLO also shows *rate of flow* to give *complete* flow information instantly, accurately and continuously without the use of conversion tables or secondary instruments.

**SUPERIOR PERFORMANCE** of the MASTERFLO meter is a result of Sparling's exclusive magnetic drive. A combination of magnets in propeller and drive shaft permits entire gear box to be hermetically sealed. Vital parts are protected from corrosion, and without packing glands, friction is negligible. Accuracy is assured; maintenance is reduced; meter life is extended.

**SPARLING MASTERFLO** MAIN-LINE METERS represent the most advanced metering equipment in the water works field. Sizes 4" to 24" and suitable for 150 or 250 psi working pressure.

**SPARLING**
WATER CONTROL EQUIPMENT

*Call your nearest Sparling office for complete information, or write for Technical Bulletin CF-907-1*

**SPARLING METER COMPANY** *225 N. Temple City Blvd., El Monte, California*

Atlanta 3 • Chicago 4 • Cleveland 13 • Dallas 1, Tex. • Denver 6 • Kansas City 6, Mo. • Roselle, N. J. • San Francisco 24 • Seattle 99 • Romford, England

# Equipment News

CONTINUED FROM PAGE 25A

the customer. Frequently, shop fabrication of the column is possible. On certain sizes the base can be arranged to provide a streamlined housing for pumps and other necessary equipment.

The Aquatower is available to capacities up to 250,000 gallons. All fittings used in the Aquatower are standard. Specifications conform to AWWA and NBFU standards.

## Trench Drills

909

The Salem Tool Company, Salem, Ohio has introduced a new series of trench drills capable of drilling 400′ and pushing pipe as far as 250′. The unit (Model 24-TD) is being used by contractors and utilities to install water, gas, electric and phone lines under streets, highways and railroads without cutting paving.

The drill is powered by a 52 HP gasoline motor; has 4-speed transmission; electric starting; forward thrust of 30,000 lbs.; and maximum torque at the auger of 6500 ft. lbs. It is equipped with variable hydraulic feed in a rigid frame for drilling accuracy. Pipe pusher and one guide are standard equipment.

## Positive Displacement Feeder

910

B-I-F Industries, Inc., Providence, R. I., has introduced a new, electrically driven, positive displacement chemical proportioning pump. Proportioneeers Model 1210 Chem-O-Feeder features a corrosion resistant transparent plastic head, Hypalon diaphragm and check valves, and a straight-through flow design.

Efficient and compact, the Model 1210 Proportioneers Chem-O-Feeder accurately and uniformly proportions chemical solutions, acids and alkalies to process water in industry. The new pump is available in three models, Simplex, Duplex and Triplex, for adjustable, wide-range proportioning up to 12, 24 and 36 gallons per hour with discharge pressures up to 125 pounds per square inch.


# NEW BANTAM C-350

You have the widest choice of options and mountings in the industry with the new BANTAM Series 350—to build your new BANTAM exactly to your job and price requirements.

## Work faster . . . earn more than ever!

This all-new BANTAM crawler model brings a brand-new set of profit benefits to water and sewer contractors—high-production digging advantages never before offered in a machine of this popular size!

Now with the BANTAM C-350 you can dig to 18′10″ with optional long-boom back hoe—backed by the power and fast-action cycle that take you through even the toughest rocky, frozen or hard pan terrain with highest speed and ease. BANTAM's all-new undercarriage has the solid stability to climb and work even tough grades with standard or long side frames . . . the high flotation, with pads up to 32″ wide, to give you big production in wet conditions. Keep ahead of any job schedule with BANTAM's *standard* 2-speed, independent travel; and full-reversing, 2-speed travel transmission.

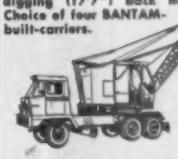
BANTAM'S fast, accurate mechanical controls give you the precision digging that speeds up ticklish work when crossing water and gas laterals, etc. More time saved, more money earned!

You make more from BANTAM's all-around job versatility working with 11 BANTAM-built attachments. Handling, lifting, lowering, placing and stockpiling assignments . . . cleaning operations . . . backfilling, tamping, erecting, pile-driving—any job, anywhere. And BANTAM's practical size gives you permit-free roadability! Capacity of 7-8 tons.

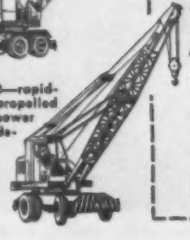
*Ask your BANTAM distributor for an on-the-job work demonstration now!*

**ALSO ALL-NEW:**

BANTAM T-350—new 11-ton capacity, increased line pulls, new deeper digging (17′7″) back hoe. Choice of four BANTAM-built-carriers.



BANTAM CR-350—rapid-performing self-propelled with hydraulic power steering . . . independent travel, swing, hoist . . . 4 x 4 optional drive. 1-man, 1-engine operation.



SCHIELD Bantam Co.

303 Park St., Waverly, Iowa

SCHIELD BANTAM CO. WS-231
303 Park St., Waverly, Iowa
Rush me full details on the all-new ☐ BANTAM C-350 crawler, ☐ T-350 carrier models, ☐ CR-350 self-propelled.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

WORLD'S LARGEST PRODUCER OF TRUCK CRANE-EXCAVATORS

## CITY OF MIAMI
## SEWAGE TREATMENT PLANT

**Design Engineers**
Miami Sewer Project Associates; joint venture of
RADER ENGINEERING COMPANY
METCALF & EDDY
MAURICE H. CONNELL & ASSOCIATES, INC.

**Supervising Engineers**
METCALF & EDDY

**Contractor**
PAUL SMITH CONSTRUCTION CO.

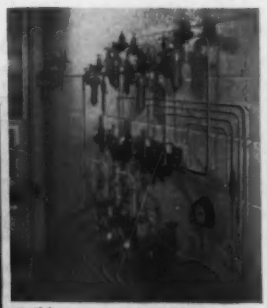
Aerial view of Miami's $27,100,000 collection and treatment facilities shows extensive layout required to rid Biscayne Bay and the Miami River of pollution.

Modern design and layout contribute to the high efficiency of this multi-million dollar plant.

**ONE SOURCE**
**ONE RESPONSIBILITY**

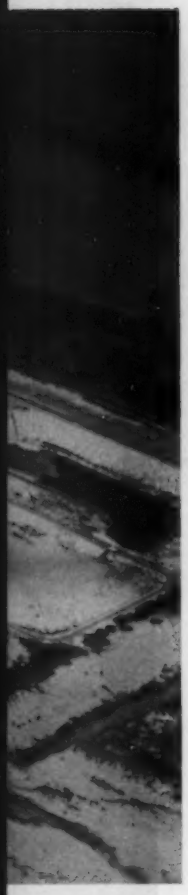
Builders self-actuated Rate-of-Flow Controllers at Effluent Water Treatment Plant assure accurate regulation of flows, filter efficiency . . . conserve head.

B-I-F *standard* main recording panel which centralizes essential operating data from remote stations.



Builders custom hydro-pneumatic accessories provide positive valve control and are capable of manual operation on loss of air.

Flow rate through Parshall Flume is transmitted pneumatically to several indicators and recorders installed at strategic operating points.



# For New 47,000,000 GPD Treatment Plant...

# SINGLE, RESPONSIBLE SOURCE FURNISHES COMPLETE INSTRUMENTATION, CONTROL AND CHEMICAL FEEDING EQUIPMENT

**B·I·F *Builders-Providence* equipment plays vital role in maintaining Miami's high rate activated sludge type installation at peak efficiency.**

Miami's new sewage treatment plant covers a 65 acre site on Virginia Key. A fully integrated control system is needed to centralize the operation of the many functions involved in such a widespread installation.

When this equipment is supplied by a single responsible source, the coordination of efforts during the planning, installation and start-up stages results in immediate and long term savings both in time and money.

Miami, like so many other municipalities, is benefiting from B-I-F's ONE SOURCE — ONE RESPONSIBILITY. For greater system reliability and operating economies, write . . .

**B-I-F Industries, Inc., Utilities Sales, 350 Harris Avenue, Provi ence 1, R. I.**

B·I·F

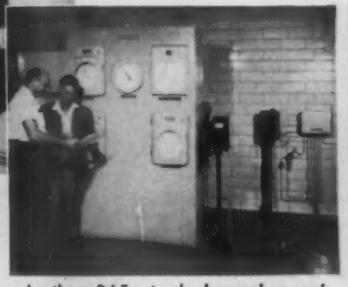
## B-I-F INDUSTRIES

BUILDERS-PROVIDENCE • PROPORTIONEERS • OMEGA

Modern rate-of-flow pendulum-operated diaphragm units provide continuous, dependable flow regulation over 24 to 1 range.

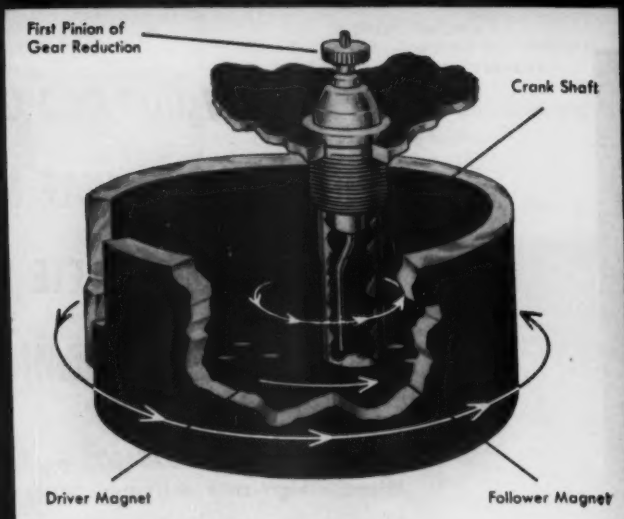
Omega Universal Dry Feeder accurately proportions lime to flow rate of effluent water treatment . . . conserving chemicals and insuring correct dosage despite output variations.

In pipe gallery, operator uses Proportioneers Chem-O-Feeder to add correct dosage of foam control chemicals . . . reliable equipment on standby duty!



Another B-I-F *standard* panel records aeration air, air temperature (wet and dry bulb), digester gas burned by engines, and indicates air to sewage ratio. Wall-mounted summator at right gives *accurate and continuous summations* of air output of four blowers.

Builders Conveyoflo meter accurately totalizes as well as indicates hourly rate of filtered sludge discharged to incinerator. B-I-F supplies a complete line of equipment (meters, feeders, controls) for *positive control of materials in motion.*




# THE POWERFUL PULL OF A PERMANENT MAGNETIC DRIVE

In the Rockwell Sealed Register meter the register is driven by a powerful magnetic coupling of Alnico alloy. This construction eliminates the need for a stuffing box. It permits the register and all reduction gearing to operate in a hermetically sealed chamber high and dry above the flowing stream. With a sealed barrier against dirt and corrosion, lighter instrument type gears and pinions can be employed which reduce the drag on the measuring chamber and thereby improve meter accuracy and response.

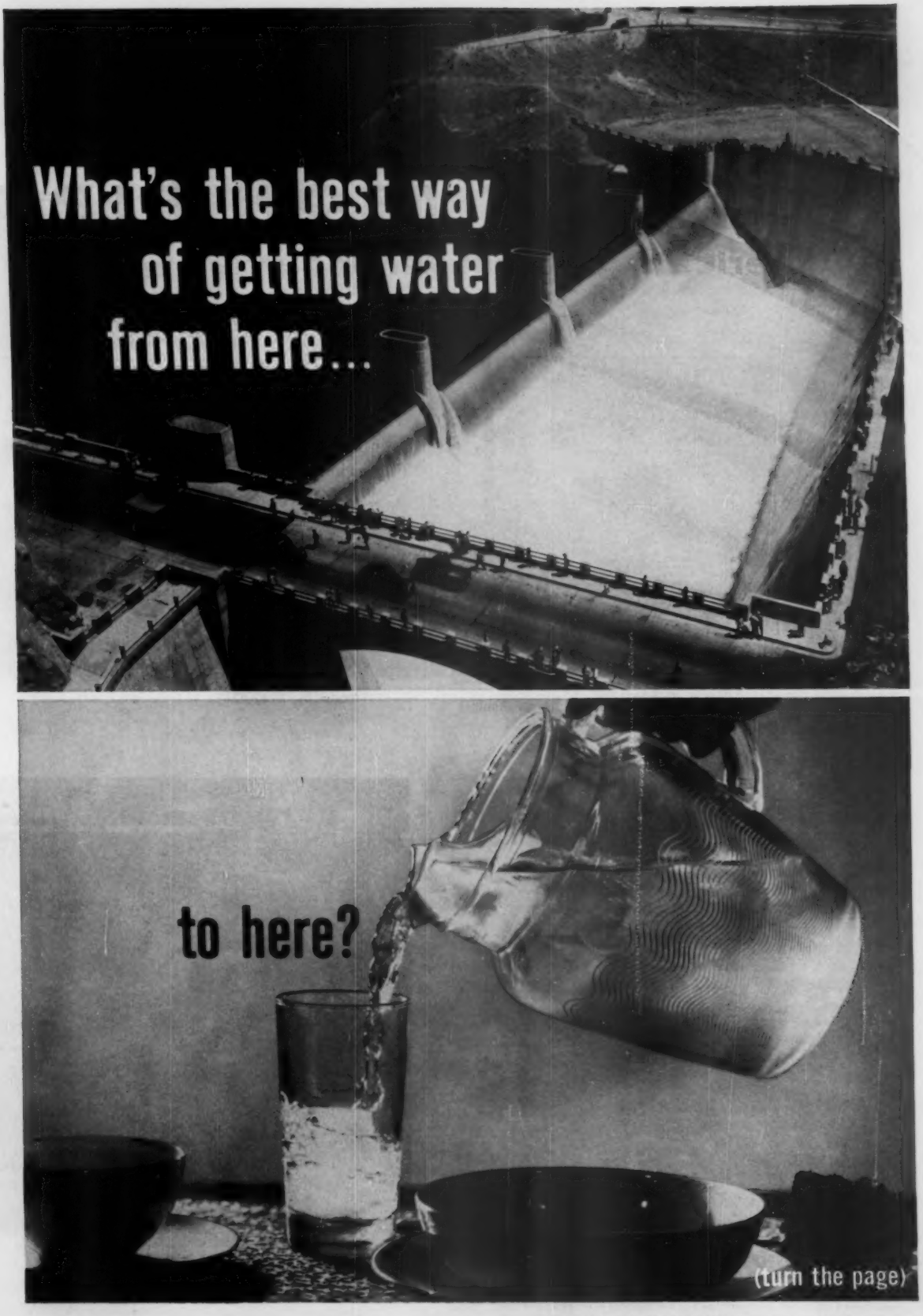
The magnetic drive itself is fully shielded to prevent "cheating." And its powerful magnetic force is good for a lifetime of operation. For descriptive bulletin write Rockwell Manufacturing Co., Pittsburgh 8, Pa.

**Now available in both 5/8" and full 3/4" sizes**

SEALED REGISTER METERS

another fine product by

**ROCKWELL**


What's the best way
of getting water
from here...
to here?
(turn the page)

# CAST IRON PIPE

## America's greatest water carrier

Installation of 2000 feet of 12-inch mechanical joint cast iron pipe along state highway.

### *Why do we say that?*

This year, as every year, more miles of underground cast iron water mains are in use than all other kinds of pipe combined.

Furthermore, more miles of cast iron water mains are now being purchased and laid than of any other kind of pipe.

Yes, cast iron is always the favorite. A recent impartial survey showed that consulting engineers and water utility officials prefer cast iron pipe for underground water distribution by an overwhelming majority.

Eight-inch cast iron pipe ready for installation of 2-main water system in new subdivision.

Installation of 60-inch flanged pipe and fittings for circulating condenser water in a power plant.

Major additions to a municipal water system totaled 116,080 feet of slip-on joint cast iron pipe in 6-, 10- and 12-inch sizes.

Private water company main extension of 6-inch slip-on joint pipe for housing development.

## *What are its advantages?*

- LONG LIFE. The cast iron pipe you install today will be performing economically a hundred years from now.
- HIGH-CAPACITY FLOW. Cement-lined cast iron pipe will deliver the full-rated flow all through the years. No other pipe, size for size, can carry more water.
- CORROSION RESISTANCE. Long life proves it. Most water utilities are still using the first cast iron pipe they installed.
- GREAT BEAM STRENGTH. Cast iron pipe resists the effect of heavy traffic, shifting soils.
- TREMENDOUS LOAD RESISTANCE. Six-inch cast iron pipe (Class 150) withstands a load of nearly nine tons per foot!
- PRESSURE-TIGHT JOINTS. You have a complete choice of leakproof, easy-to-assemble joints. You need a minimum of tools and work crew.
- EASE OF TAPPING. No tapping saddles needed. Takes threading best of all kinds of pipe.

*. . . good reasons for you to choose*

**CAST IRON PIPE**

THE MARK OF THE 100-YEAR PIPE

Write for complete information to Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 3440 Prudential Plaza, Chicago 1, Ill.

**A BATH WAS AN OCCASION** in Grandfather's day. Setting up the tub, heating bucketfuls of water was a chore even the fussiest usually confined to one day a week—Saturday night.

**EVERYDAY IS SATURDAY TODAY.** With clean, pure water... carried through cast iron pipe... the shower or bath today is an accepted part of American living.

**U.S.** CAST IRON **PIPE**

**FOR WATER, SEWERAGE AND**

**U. S. PIPE AND FOUNDRY COMPANY**

# but better than ever today!

***Mine-to-main control assures***
***U. S. Pipe quality in service***

Water, harnessed and put to work, is the firmest base on which a community can build.

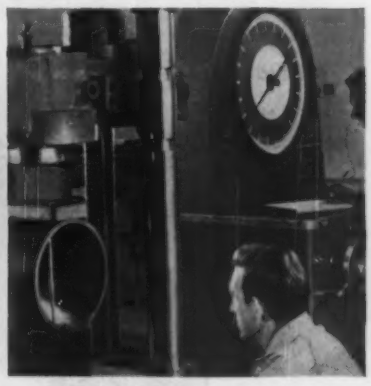
Water officials are doing an outstanding job keeping the nation's water pitcher filled. Cast iron pipe is their most dependable ally.

To furnish that dependability . . . in every detail . . . U. S. Pipe controls production every step of the way. From mine to final shipping U. S. cast iron pipe is subjected to intensive quality checks. . . checks to provide long life, efficiency, trouble-free service.

Quality is built into U. S. cast iron pipe.

**CLEANING ORE.** U. S. Pipe ore cleaning plant at a mine where ore is crushed and passed through separators to float off impurities.

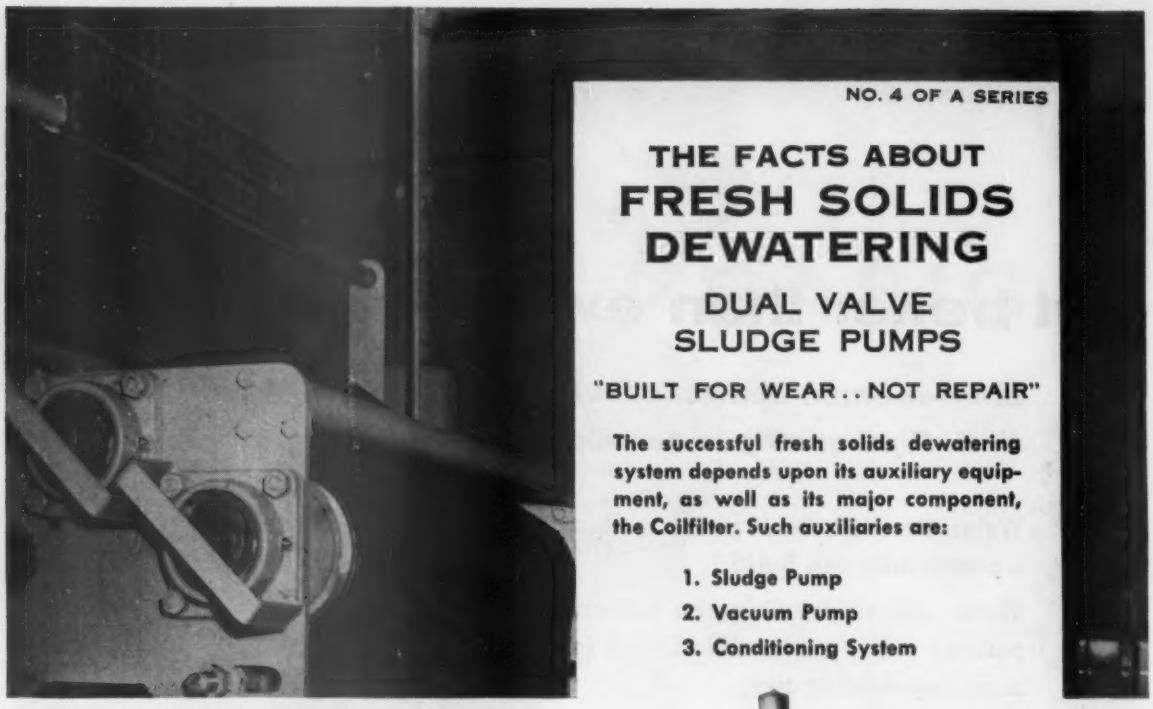
**MOLTEN IRON** in a measured amount is poured into a machine ladle, preparatory to the start of the centrifugal casting cycle.



**VIGILANCE.** Specimens of U.S. Pipe are periodically subjected to a ring crushing test in a 200,000 pound universal testing machine.

**INDUSTRIAL SERVICE** CAST IRON

**Birmingham 2, Ala.** *A wholly integrated producer from mines and blast furnaces to finished pipe.*



NO. 4 OF A SERIES

# THE FACTS ABOUT FRESH SOLIDS DEWATERING

## DUAL VALVE SLUDGE PUMPS

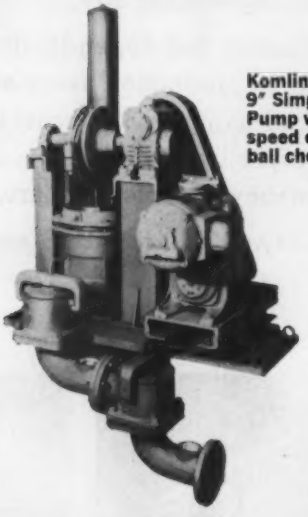
"BUILT FOR WEAR . . NOT REPAIR"

**The successful fresh solids dewatering system depends upon its auxiliary equipment, as well as its major component, the Coilfilter. Such auxiliaries are:**

1. **Sludge Pump**
2. **Vacuum Pump**
3. **Conditioning System**

**Illustrated above: Elizabethton, Tenn., Sewage Treatment Plant, Consulting Engineers: Allen & Hoshall**

**Komline-Sanderson heavy duty plunger pumps include 35,000# psi tensile strength iron for all castings. Constant speed motors with new type drive mechanism eliminate V-belts or pulleys, reducing the dimensions of the base plate by approximately 40%. Valve chambers incorporate large open areas, minimizing clogging, increasing velocity of sludge and reducing "settling out" of sludge.**



**Komline-Sanderson 9″ Simplex Plunger Pump with variable speed drive and dual ball checks.**

**Komline-Sanderson 9″ Simplex Plunger Pump with constant speed drive.**

**Dual ball check valves assure uninterrupted flow and constant, positive metering. Stuffing boxes are large, using ¾″ square packing to provide the optimum in sealing characteristics.**

**For *positive pumping* specify Komline-Sanderson heavy duty sludge pumps.**

## KOMLINE-SANDERSON ENGINEERING CORPORATION

PEAPACK, NEW JERSEY

MANUFACTURER OF COILFILTER SLUDGE VACUUM FILTERS AND AUXILIARY EQUIPMENT FOR DEPENDABLE FRESH SOLIDS DEWATERING

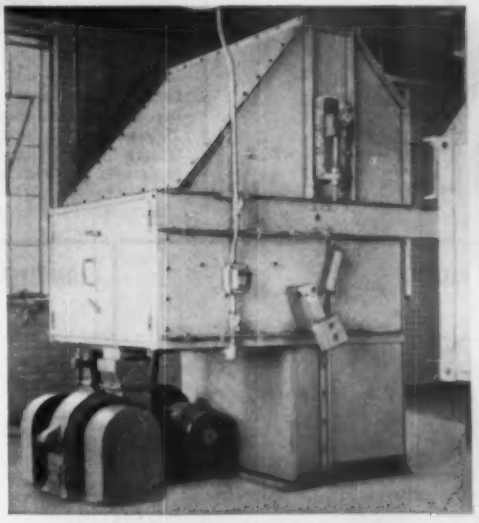
# WHICH SCREEN

## *is best for your job?*

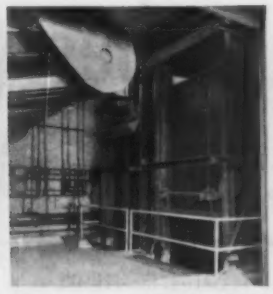
**LINK-BELT builds a complete line for efficient removal of solids**

## COARSE?

Link-Belt coarse screens, commonly known as bar screens or racks, are preferred in water, sewage and industrial waste treatment plants where the water contains a considerable volume of large solids that might damage or clog subsequent equipment. They consist of a series of parallel bars in the flow channel —either vertical or inclined.



**THRU-CLEAN BAR SCREENS.** Automatic, chain operated rakes clean from down-stream side . . . eliminate jamming by debris. Vertical or inclined bars.

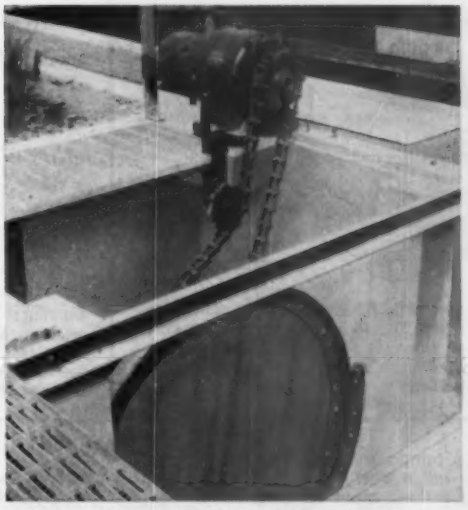


**STRAIGHTLINE BAR SCREENS.** Automatic, jam-proof, cable-operated rake cleans from up-stream side, assures clean, positive screenings removal.

**TRITOR SCREENS.** Combined screen and grit chamber saves smaller plants the cost of separate units to remove large solids and grit.

## FINE?

Link-Belt fine screens provide for efficient removal of small solids. They protect subsequent equipment, prevent pollution of streams and often recover valuable products. These screens use a relatively fine mesh cloth making them applicable to water intakes, industrial waste treatment and industrial solids recovery.



**REVOLVING DISC SCREENS.** For applications similar to rotary drum screens, but where volume is less. Easily installed.

**ROTARY DRUM SCREENS.** Effectively remove fine solids from large volumes of water. For fixed water level installations.

**LIQUID VIBRATING SCREEN.** For thorough removal and dewatering of fine solids with minimum blinding of screen cloth.

Efficient water and waste treatment begins with a Link-Belt screen. This broad line is your assurance of an impartial recommendation based on the specific nature of your waste. For more data, contact your nearest Link-Belt office or write for Screening Equipment Book 2587.

**LINK-BELT**

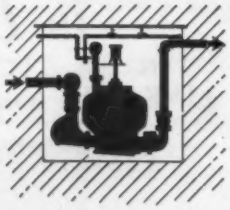
**SANITARY ENGINEERING EQUIPMENT**

**LINK-BELT COMPANY:** Executive Offices, Prudential Plaza, Chicago 1. Sanitary Engineering Regional Offices—Colmar, Pa., Chicago 9, Kansas City 8, Mo., San Francisco 24. Sales Offices in All Principal Cities. Export Office, New York 7. Representatives Throughout the World. 18,010

**See our exhibit, Federation of Sewage and Industrial Wastes Assns., Memorial Auditorium, Dallas, October 11-15**

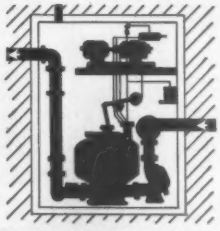
# Which sewage lift station is best for your job?

### TOPS IN DEPENDABILITY AND SAFETY



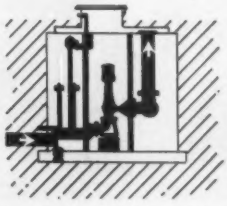
Concrete or steel underground station with Shone® Type S pneumatic ejector, mechanically controlled (warranted 25 years). Remote air supply. Nothing electrical; maintenance free; operates even under water. Life measured in decades. For municipalities and large subdivisions.

### SURPRISINGLY VERSATILE, INEXPENSIVE



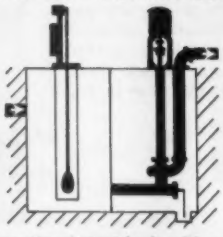
Shone® Type SAC station, underground in concrete vault. Mechanically controlled ejector (warranted 25 years) has its own compressor. Frequently less costly than package stations. Finds use everywhere.

### PACKAGE STATION



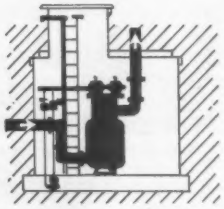
Quality underground station with vertical, short-coupled (Series 6260), dry pit centrifugal pumps. Quality design and equipment give good service life at nominal cost. For small permanent stations, growing areas.

### LOW FIRST COST—EASY INSTALLATION



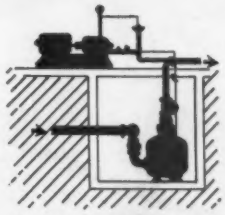
Two-compartment steel basin with centrifugal vertical wet pit pump. Pumps are not submerged; motors protected from flooding. Low first cost; fast installation. For buildings, small growing subdivisions.

### ULTIMATE IN PACKAGE DESIGN



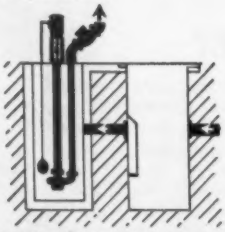
Package underground station with Expelsor® pneumatic ejector, electrode controlled. Sanitary and dependable, low maintenance, easy to service. Recommended for municipal and subdivision applications.

### BUILDING TYPE STATION



Expelsor® pneumatic ejector station designed for use in buildings. Compressor is on basement floor; ejector on floor below. Sealed installation gives safe, odorless handling of sewage indoors.

### SPECIAL PROBLEMS?



Centrifugal vertical wet pit pumps with adjoining settling basin. Good for areas where sand or old sewers create problems. Special pump construction for abrasive or corrosive conditions, industrial wastes.

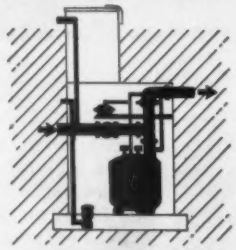
The answer depends on the job. Is it to be a temporary station? What about future loads? How much maintenance will it get? What type of power is available? These and many other questions must be weighed carefully and without bias. In making the decision, why not put Yeomans 61 years' experience (59 on underground stations alone) to work? Because Yeomans builds the only complete line of sewage lift stations in the industry, recommendations are impartial and in your best interest. Phone, wire, or write now.

**YEOMANS**

1999-9 N. Ruby St., Melrose Park, Ill.

**SPECIALISTS IN SEWAGE LIFT STATIONS—THE COMPLETE LINE**

### MAXIMUM RELIABILITY—MINIMUM SPACE



Package underground station. Expelsor® pneumatic ejector has two compartments, duplex compressors and controls. Excellent service accessibility. Especially suited for subdivision and municipal lift stations.

L-5911

# MUELLER®
## PLANT VALVES
## ideal for use in:

WATER FILTRATION PLANTS
SEWAGE TREATMENT PLANTS
PUMPING STATIONS • INDUSTRIAL PLANTS
POWER PLANTS • DRAINAGE PROJECTS
FLOOD CONTROL PROJECTS

### NEW! HEAVY DUTY CHECK VALVES

. . . specifically designed to reduce wear caused by repeated opening and closing when used in such installations as pump suction or discharge lines. All working parts are heavily constructed from high-strength materials to assure long, dependable operation without maintenance. Suitable for vertical or horizontal use. Swing type, Swing type with Lever and Weight, and Swing type with Lever and Spring available.

**Iron body, fully bronze mounted**
**Bronze seat ring**
**Bronze disc ring or rubber faced disc**
**Flanged, screwed or hub ends**
**Working pressure: 175 p.s.i.**
**Test pressure: 300 p.s.i.**

### FLAP VALVES

. . . for use where flow is desired in one direction only and to the atmosphere; for example, a river levee installation. The area behind the levee would drain into the river only when the river was low and below the flap valve. A higher level of the river would seal the valve.

**Iron body, fully bronze mounted**
**Bronze seat ring, disc ring and hinge pin**
**Flanged, hub or spigot frame**
**Sizes: 4" through 24"**

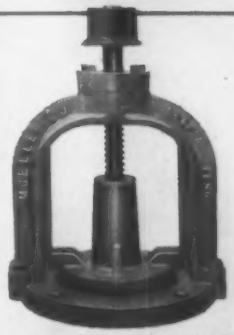
### SHEAR GATES

. . . for use in any application where one side of the valve is open to the atmosphere and manual operation is desired. Design permits full opening of gate with no obstruction of orifice. Slight wedging action gives positive seal when closed. Flow may be in either direction. Furnished with lift handle and catch.

**Iron body, fully bronze mounted**
**Bronze seat ring, disc ring and hinge pin**
**Flanged, hub or spigot frame**
**Sizes: 4" through 24"**

### MUD VALVES

. . . usually used for draining tanks or reservoirs by mounting in floor. Non-rising stem or self-contained rising stem type available. Normally furnished with 2" square wrench nut but handwheel, extension stem or extension stem and floor stand may be specified.



**Iron body, fully bronze mounted**
**Bronze seat ring, disc ring and stem**
**Flanged or spigot frame**
**Non-rising stem sizes: 3" through 24"**
**Rising stem sizes: 4" through 18"**

### VALVE OPERATING EQUIPMENT

**A full line of extension stems, floor stands, bench stands, geared floor stands, chain and sprocket wheels, wrenches and other valve operating equipment and accessories are available for valve installations requiring operating mechanisms.**

*Write for complete information and specifications.*

MUELLER CO. Since 1857 SERVICE Waterworks Products QUALITY

**MUELLER CO.**
**DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario.

# K&M

# ASBESTOS-CEMENT PRESSURE PIPE

## Exclusive, patented FLUID-TITE Coupling that's 5 years ahead—connects in only two steps without heavy machinery!

Streamline installation . . . reduce costs and time . . . with modern "K&M" Asbestos-Cement Pressure Pipe.

To connect pipe to coupling, just lubricate the rubber gasket—and slide the pipe in! You can lay more pipe per hour than ever before, and do it under all weather and soil conditions—even in water and muddy trenches.

But, that's not all.

Tough, hardy "K&M" Asbestos-Cement Pressure Pipe is a miser concerning maintenance. It firmly holds down pumping costs, and sends maintenance costs tumbling. This durable-as-stone pipe won't corrode or tuberculate, and is completely immune to electrolysis. Permanently sealed joints remain water-tight always.

That's why communities from coast to coast have discovered that the low initial cost of top-quality "K&M" Asbestos-Cement Pressure Pipe is often the last cost.

What makes "K&M" Asbestos-Cement Pressure Pipe so special? Eighty-five years of asbestos engineering by one of America's pioneers in asbestos products. Put this wealth of experience to work for you. Write to us today.

The finest coupling in the industry! Exclusive, patented "K&M" FLUID-TITE Coupling connects in two easy steps. Seals tight and stays tight . . . no matter how high the pressure climbs. Rubber sealing gaskets are self-energizing. No cumbersome coupling puller is required. And, a 5° deflection per coupling, if you need it.

K·M
BEST IN ASBESTOS

**KEASBEY & MATTISON**
COMPANY • AMBLER • PENNSYLVANIA

# Hamilton's new Treatment Plant— another major step in Ohio River Clean-up Program

*Aerial view shows four P.F.T. Floating Cover Digesters*

*Efficient and economical digester heating is provided by these P.F.T. heaters.*

Hamilton's new sewage treatment plant is the culmination of a ten year sewerage improvement program. Serving Hamilton directly, this fine new plant helps to restore the Great Miami River just before discharging into the Ohio. Twenty-five miles from Cincinnati, Hamilton is a growing city which is proud to shoulder its share of the responsibility in the Ohio River Valley Clean-up Program.

P.F.T. equipment playing a vital role in this plant includes: four 80' Floating Covers, two #1000 Heater and Heat Exchanger Units, Supernatant Draw-off Equipment, Floating Cover Position Indicators with High and Low Level Alarms, miscellaneous Gas Safety Equipment.

The engineering firm of Consoer, Townsend and Associates, Chicago, designed this modern plant.

P.F.T.

Waste Treatment Equipment
Exclusively since 1893

**PACIFIC FLUSH TANK CO.**
4241 Ravenswood Avenue
Chicago 13, Illinois

PORT CHESTER, N. Y. • SAN MATEO, CALIF. • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

# MUELLER®

## SERVICE CLAMPS

### fast, permanent connections to any main

Entire body heavily galvanized for maximum resistance to corrosion.

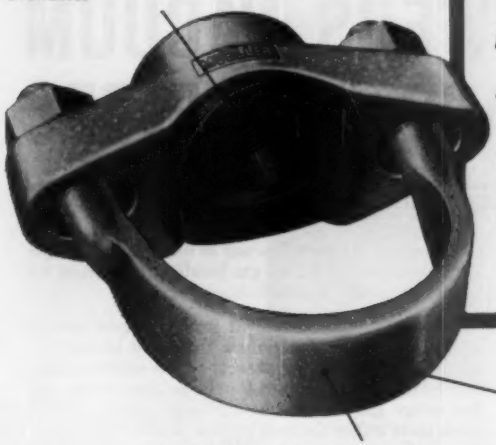
Tough, malleable iron body accurately fits contour of pipe and gives maximum strength and rigidity.

Full length threads, precision machined in thick body boss, assure solid, leak-proof connections.

Unusually large cross sectional area provides maximum strength during installation. Even the smallest clamp has a ⅜" diameter strap because this is the smallest size bolt that cannot be broken by a normal individual in normal use.

Rolled steel, cadmium plated nuts accurately machined to give solid, permanent connection without re-tightening. National Standard threads give maximum strength by assuring precise fit.

Neoprene gasket, recessed into body, is not affected by water and gives positive, easily-made seal. Regularly furnished, neoprene gasket is cemented in place for ease of installation. Lead ring gasket also available.



**SERVICE CLAMP**

Mueller or Iron Pipe thread tapping.

Tapping sizes from ½" through 2".

Pipe sizes from 1" through 12".

Single or double strap type.

Heavy cadmium plating on strap and threads gives maximum resistance to corrosion.

Forged steel straps, accurately curved to fit pipe, are as wide and flat as practicable to give maximum bearing and greater stability.

Flattened strap gives large contact area—increasing life of clamp by reducing effect of corrosion.

**All Mueller Service Clamps now packed in labeled, corrugated cartons for ease in handling, shipping and storing.**

*These features are typical of the attention to detail in research, design and engineering that becomes a part of every Mueller product manufactured for the water industry. Write for complete information.*

**MUELLER CO.**

**DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

# R-C AIR BLOWERS, VACUUM PUMPS AND GAS METERS

## Selected for Miami's $27-million Pace-setting Sewage Disposal Project

Eight years of preparation and three years of construction have given the City of Miami one of the most modern, integrated sewage disposal systems in the country. An overall pollution abatement program included the construction of intercepting sewers, pumping stations, a force main across Biscayne Bay, a treatment plant on Virginia Key, and an outfall extending nearly a mile into the ocean. The sewage treatment plant is a high-rate activated-sludge type with a designed capacity of 47,000,000 gallons per day, estimated to meet the city's needs until 1965.

In such an installation as this, where operation is continuous and largely mechanized, only the best, most reliable equipment will serve. In many areas throughout the plant where air or gas were to be handled, Roots-Connersville equipment was selected, because only R-C equipment could meet the exacting specifications. And only R-C equipment could deliver the kind of performance required in this service—dependable, around-the-clock operation with a minimum of maintenance. For no other manufacturer has had so many years of experience producing air and gas handling equipment for sewage treatment applications.

The R-C equipment selected for the Miami sewage treatment plant includes three rotary air blowers for grit removal, four rotary blowers for the aeration tanks, two rotary vacuum pumps for sludge dewatering, and five rotary gas meters for measuring sludge gas. All these units utilize the well known "Roots" rotary positive displacement principle to assure top performance for long years of service.

R-C blowers, pumps and meters such as these are available in a wide range of sizes and capacities to meet every standard or special application. In addition, Roots-Connersville produces centrifugal blowers and Spiraxial® compressors. All are backed by the unmatched reputation established by Roots-Connersville in more than a century of manufacturing air and gas handling equipment.

**ROOTS-CONNERSVILLE BLOWER**
**DIVISION OF DRESSER INDUSTRIES, INC.**
959 Mount Ave., Connersville, Indiana. In Canada—629 Adelaide St., W., Toronto

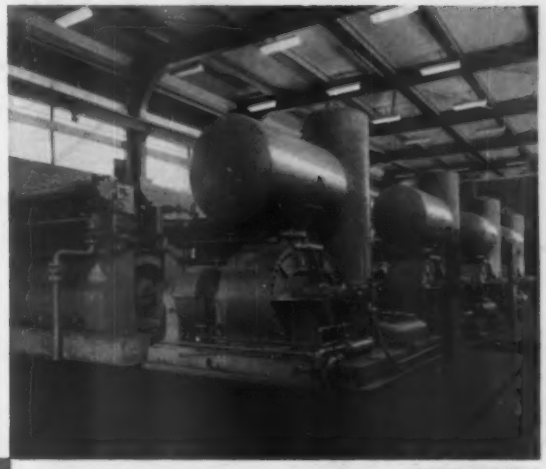
*Additional data about Roots-Connersville equipment appears in* **Chemical Engineering Catalog, Mechanical Catalog and Sewage Manual.** *Or write us for specific information about any problem in the handling of gas or air.*

**CITY OF MIAMI**
**SEWAGE TREATMENT PLANT**
**MIAMI, FLORIDA**

*DEPT. OF WATER AND SEWERS, CITY OF MIAMI*
C. F. Wertz, Director
Garrett Sloan, Chief Engineer
David P. Blackmeyer, Superintendent

*ENGINEERS*
Metcalf & Eddy, Boston, Mass.

*CONTRACTOR*
Paul Smith Construction Co.
Tampa and Miami

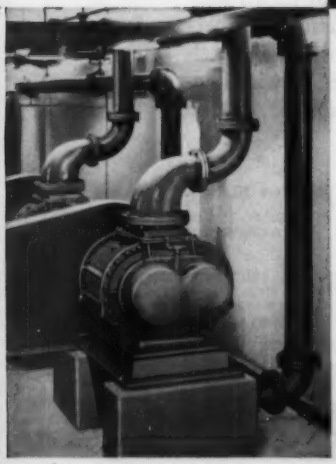


**AERATION BLOWERS**

*Air for the aeration tanks is supplied by these four 24 x 28½ rotary positive displacement blowers of the two lobe type. Each blower has a capacity of 10,400 cfm at a discharge pressure of 7.5 psig and is driven at 514 RPM by a 410-HP engine. Two engines are dual-fuel engines and the other two are spark-ignition gas engines.*

**GAS METERS**

*R-C rotary positive displacement meters are used to measure the sewage sludge gas produced in the digestive process. This gas is supplied as fuel to the engines driving the aeration blowers. Illustrated is a 4 x 12 low-pressure meter handling 10,000 cfh of sewage sludge gas. Four other 3½ x 10 R-C meters are also used, each with a capacity of 6000 cfh.*



**GRIT CHAMBER BLOWERS**

*In the grit chambers, these three R-C rotary blowers supply air to remove grit from incoming raw sewage. Each unit is an 8 x 8 blower driven at 320 to 640 RPM by U.S. Varidrive, discharging against 7 psig. The blowers furnish up to 6.3 cubic feet of air per lineal foot of tank when all three blowers and two tanks are operating.*

**VACUUM PUMPS**

*After elutriation, sludge is dewatered. These two 14 x 21 rotary blowers are used as dry vacuum pumps on dewatering filters. Each pump has a capacity of 1,630 cfm and provides a vacuum of 12 to 15 inches Hg., referred to a 30" Hg. barometer, when operating at 415 RPM.*

# FINANCIAL PROTECTION

## for your most vital service

Water . . . your community's most important single service . . . must be protected by sound financing. The only *sure* protection is the sustained accuracy of your water meters.

If a meter becomes inaccurate, it starts to give away revenue. In home after home, leaks and carelessness go scot-free. The warning voice of the meter is gradually stilled, and wanton waste soon uses up your available water supply.

Worse yet, lack of proper income makes it impossible to build new capacity without tremendous losses. Water shortages soon become critical. Your city's development program soon dies . . . of thirst.

How guard against this? Set up a good meter testing and repair program. Pick meters that stay accurate longer. Talk to your meter superintendent . . . the man whose efforts guard your water supply. Ask which brand of meter consistently gives highest sustained revenue . . . with lowest repair and depreciation. We sincerely believe your answer will be "Trident."

**NEPTUNE METER COMPANY** 19 West 50th Street • New York 20, N. Y.

**NEPTUNE METERS, LTD.** 1430 Lakeshore Rd. • Toronto 14, Ont.

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TRIDENT WATER METERS

Vol. 106, No. 9 · September, 1959

*A Scranton Gillette Publication*

**WATER & SEWAGE WORKS**

That the age of push button water treatment is coming is shown in . . .

# Instrumentation in Water Works

RESUME: The water works industry, particularly municipal and industrial service, may be divided into three phases: Source of supply (Resources); Treatment (Purification); and Distribution. In each phase, there is need to measure, control, and record information on this important commodity. Measuring instruments and controllers are widely used in water works to conserve water supplies, increase efficiency of treatment processes and maintain adequate distribution service. Some of these instruments are well-known, standard types, but many are designed especially for water works applications.

by PHILIP L. VOELKER, Utilities Project Eng., B-I-F Industries, Providence, R. I.

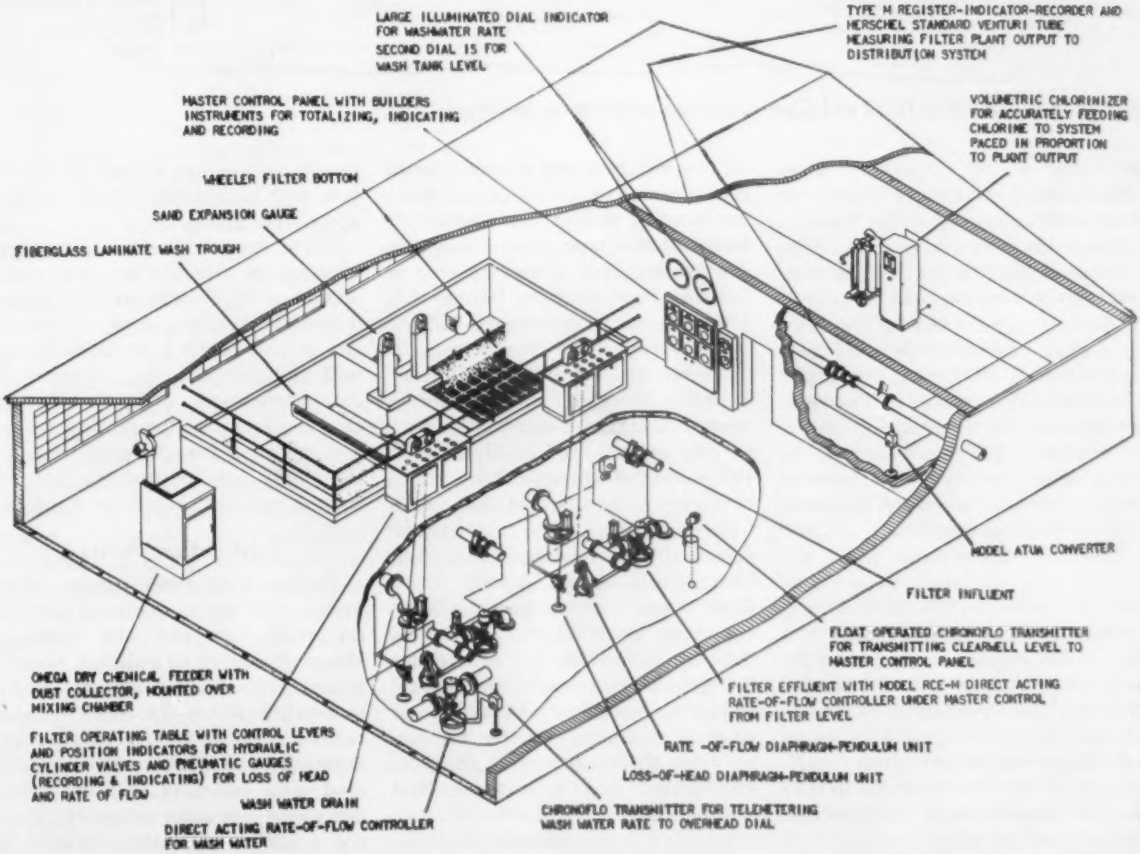

LARGE ILLUMINATED DIAL INDICATOR FOR WASHWATER RATE
SECOND DIAL IS FOR WASH TANK LEVEL
TYPE M REGISTER-INDICATOR-RECORDER AND HERSCHEL STANDARD VENTURI TUBE MEASURING FILTER PLANT OUTPUT TO DISTRIBUTION SYSTEM
MASTER CONTROL PANEL WITH BUILDERS INSTRUMENTS FOR TOTALIZING, INDICATING AND RECORDING
VOLUMETRIC CHLORINIZER FOR ACCURATELY FEEDING CHLORINE TO SYSTEM PACED IN PROPORTION TO PLANT OUTPUT
WHEELER FILTER BOTTOM
SAND EXPANSION GAUGE
FIBERGLASS LAMINATE WASH TROUGH
MODEL ATUA CONVERTER
FILTER INFLUENT
FLOAT OPERATED CHRONOFLO TRANSMITTER FOR TRANSMITTING CLEARWELL LEVEL TO MASTER CONTROL PANEL
OMEGA DRY CHEMICAL FEEDER WITH DUST COLLECTOR, MOUNTED OVER MIXING CHAMBER
FILTER EFFLUENT WITH MODEL RCE-M DIRECT ACTING RATE-OF-FLOW CONTROLLER UNDER MASTER CONTROL FROM FILTER LEVEL
FILTER OPERATING TABLE WITH CONTROL LEVERS AND POSITION INDICATORS FOR HYDRAULIC CYLINDER VALVES AND PNEUMATIC GAUGES (RECORDING & INDICATING) FOR LOSS OF HEAD AND RATE OF FLOW
RATE -OF-FLOW DIAPHRAGM-PENDULUM UNIT
LOSS-OF-HEAD DIAPHRAGM-PENDULUM UNIT
WASH WATER DRAIN
DIRECT ACTING RATE-OF-FLOW CONTROLLER FOR WASH WATER
CHRONOFLO TRANSMITTER FOR TELEMETERING WASH WATER RATE TO OVERHEAD DIAL

FIG. 1. PHANTOM VIEW of a Water Filtration Plant, showing various instruments, control devices and chemical feeding equipment used in water purification.

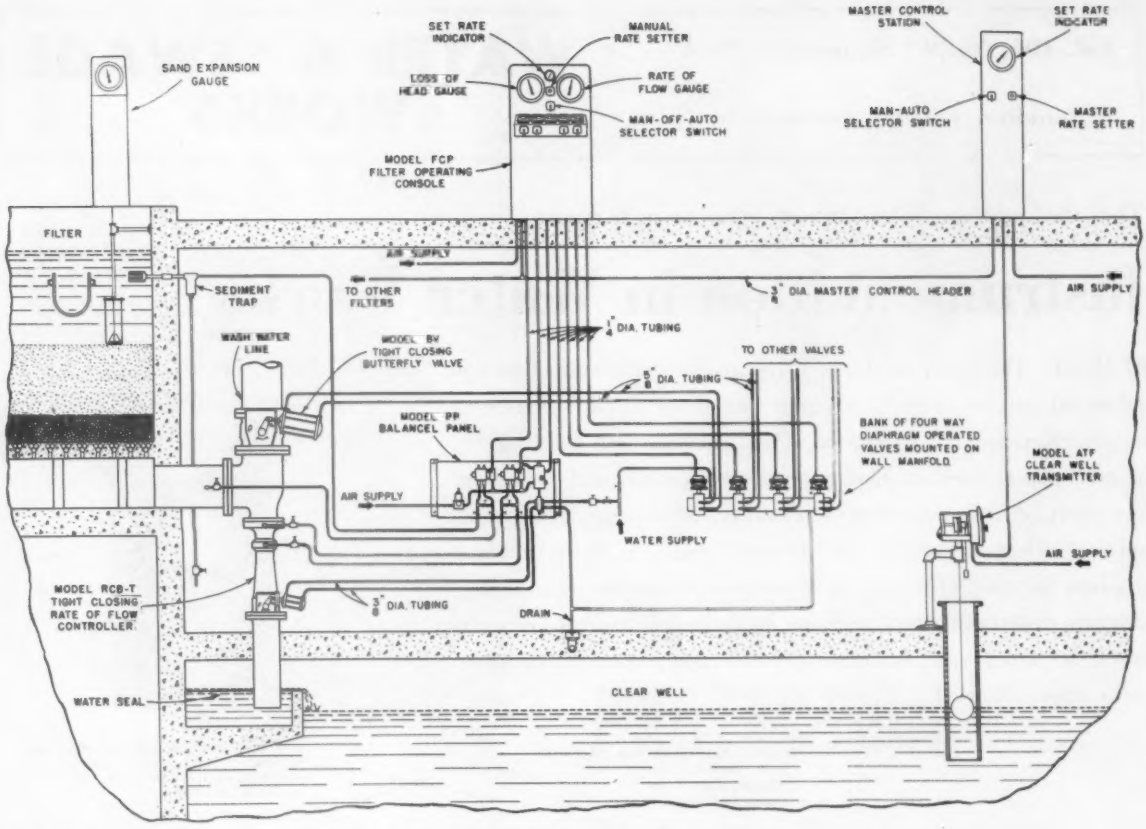



**FIG. 2. INSTRUMENTATION and Control Devices used with water filters.**

■ WHERE WATER is obtained from impounded reservoirs or lakes, the level of the supply (hence its volume) is important to the water works engineer, particularly if the available supply may become depleted in periods of drought. Levels may be measured by a float with these data indicated and recorded locally at the intake house and/or, by means of Telemeter transmission, at the pumping station or treatment plant, which may be miles from the reservoir. Several standard types of telemeters are available for these applications.

It is also desirable to know the amount of water which flows (or is pumped) from the source of supply, in order to compare this quantity with the amount treated or pumped to the distribution system. This information discloses whether or not there is leakage loss in the line and whether or not the carrying capacity of the transmission line is decreasing due to friction loss caused either by tuberculation or slime growths.

Venturi tubes and flow tubes are preferred as primary metering devices for flow measurement service in main lines because of their high accuracy and low loss of head; to a lesser extent propeller type meters, magnetic flow meters, open channel flumes or weirs also are used for this service. The secondary instruments for use with these primary devices may be totalizing and/or indicating and/or recording types and are designed to operate accurately with flow rates varying as much as 1 to 20, i.e., 5 to 100 percent of full scale.

Where water is obtained from wells, the ground water level may be measured and recorded from float level systems in special wells; draw down in specific wells may also be an important factor in the control of pumping schedules in well fields. Telemeters for transmitting flow-rate and draw-down, as well as remote supervisory control systems, are utilized for the control of a group of well pumps from a remote central control office.

By the use of audiotone transmission links, as many as twenty-five telemeter functions can be handled simultaneously over a single telephone pair, with tremendous savings in telephone lease charges.

These transmission links, together with special switches for serial connection to the circuits involved, make it possible to turn pumps on and off and receive positive report back, as well as monitoring the condition of the system itself, all upon initiation by the operator at the remote station and still using a single telephone pair. Practically any desired number of control functions can be so handled.

## Purification Plants

Treatment of water supplies may include addition of chemicals for pH correction, taste and odor removal, softening and/or coagulation, flocculation and sedimentation for solids removal, filtration for turbidity and bacteria removal, and chlorination for disinfection. Fluoridation is widely used as a means of reducing tooth decay in young water consumers. Figure 1 shows a phantom view of a water filter plant and some of the various instruments, controls and

chemical equipment used in water purification.

### Chemical Feeder Pacing

Volume of water pumped to the plant for treatment, and quantities of chemicals added must be known to assure proper treatment. Water works flow meters may be equipped with special transmitter (electric or pneumatic) or other devices which "pace," or control, the operation of either dry or solution type chemical feeders or chlorine feeders to vary the rate of chemical dosage in proportion to changes in the rate of flow of water undergoing treatment.

In one method of control the operation period of the feeder is intermittently varied so that the total operating time is proportional to flow. In another system the speed of the feeder is automatically and continuously adjusted in accordance with the changes in flow using a pneumatic control system. Dry chemical feeders may be (1) volumetric feeders which measure dry chemicals by volume with an accuracy of plus or minus 3 percent, (2) gravimetric feeders with an accuracy of plus or minus 1 percent, which may be either (a) belt-type or (b) loss-in-weight type. In many instances, particularly where fluoridation is practiced, recording devices are attached to chemical feeders to give permanent records of amounts of chemical fed in relation to the volume of water treated.

### Filtration

In the filtration process, the rate at which the water flows through the filter sand must be maintained at a constant value to provide efficient operation and maximum removal of suspended particles and bacteria. As the filter tends to become clogged and the filtration rate decreases, the rate of flow controller will open to maintain the desired rate. Figure 2 shows instrumentation and control equipment used in connection with filter operation.

*Rate-of-Flow Controllers* developed for use in filtration are of two basic types, the self-powered and the servo-powered.

Both types utilize the differential pressure created by flow through a Venturi tube as the source of regulation.

The self-powered type utilizes this differential pressure as the source of power for positioning the valve element, usually through the use of a diaphragm. The valve opening for the desired rate may be established by the position of a counterweight on a graduated scale beam or by an hydraulic or pneumatic loading pressure acting through a flexible metallic bellows. The force developed from the differential pressure acting through the diaphragm balances the weight or loading pressure, maintaining the required valve opening. Special check valves, installed in the piping from the Venturi, insure that the valve remains closed until flow differential exists, causing the controller to start from a closed position to prevent disruption of the filter media.

In the servo-powered type, the differential pressure from the Venturi tube regulates the position of a pilot valve or other positioning device to adjust flow of power water or air to and from the cylinder which positions the valve element.

*Filter Gauges* indicate and/or record the loss of head and rate of flow through the filters. "Loss of Head" is the drop pressure through the filter bed and is a direct measure of the clogging which has taken place and indicates when the filter media may be expected to require cleaning.

The rate of flow gauge utilizes the differential pressure from the Venturi section of the controller.

Mechanical operation of these gauges by cables or chains, formerly universal, is now largely confined to the smaller plants. Most larger plants today use pneumatically-actuated gauges, whose actuators can be located as desired, and whose small copper tubing connections do not obstruct the pipe gallery.

Experience has proven the efficiency of the filter washing operation depends on the expansion of the sand bed, the level reached by the top portion of the bed when borne upward by the force of the backwash, and that there is seasonal variation in the degree of expansion produced by a given rate of backwash, due to variation in specific gravity of the wash water with temperature.

To get efficient washing and pre-

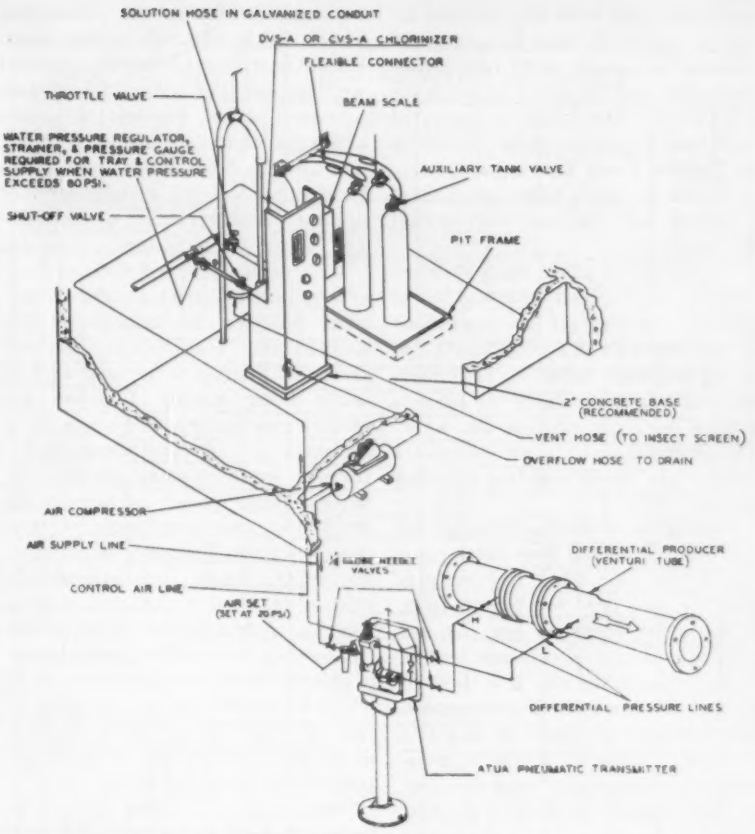

SOLUTION HOSE IN GALVANIZED CONDUIT
DVS-A OR CVS-A CHLORINIZER
FLEXIBLE CONNECTOR
THROTTLE VALVE
BEAM SCALE
WATER PRESSURE REGULATOR, STRAINER, & PRESSURE GAUGE REQUIRED FOR TRAY & CONTROL SUPPLY WHEN WATER PRESSURE EXCEEDS 80 PSI.
AUXILIARY TANK VALVE
SHUT-OFF VALVE
PIT FRAME
2" CONCRETE BASE (RECOMMENDED)
VENT HOSE (TO INSECT SCREEN)
OVERFLOW HOSE TO DRAIN
AIR COMPRESSOR
AIR SUPPLY LINE
DIFFERENTIAL PRODUCER (VENTURI TUBE)
CONTROL AIR LINE
AIR SET (SET AT 20 PSI)
DIFFERENTIAL PRESSURE LINES
ATUA PNEUMATIC TRANSMITTER

FIG. 3. AUTOMATIC PROPORTIONAL Control of Chlorine Gas Feeder.

vent loss of the finer sizes of sand the rate of backwash must be maintained constant by a wash water rate-of-flow controller, and the extent to which the filter sand is lifted must be measured by a sand expansion gauge, as shown in Figures 1 and 2.

In case the wash water comes from a storage tank, the tank level is vital information.

A number of plants have installed controls which, upon initiation by the operator, perform all the operations of washing a filter automatically, applying the wash water at preset multiple rates, and returning the filter to service on completion of the wash. The controls, which are relatively simple, can be installed in existing plants.

Summation of the flow through the filters and of several flow meter readings in the filter plant frequently is desirable, not only for the guidance of the plant operator, but also for automatic control of chemical feeders in proportion to the total flow through the several main lines. The summated flow-rate may be shown on a single recording instrument in the superintendent's office or on a large dial illuminated indicator in the filter plant or both.

### Disinfection

Disinfection of the delivered water to protect the health of the consumer is a vital phase of the water treatment process. Chlorine is the most universally accepted disinfecting agent; in its concentrated gaseous form it is noxius, irritating, highly corrosive and may be a health hazard. It must be handled with special precautions and is fed in relatively minute quantities. Chlorine gas feeders engineered for this exacting service incorporate automatic safety controls to assure protection of the operating personnel, and also incorporate flow control devices to govern with a high degree of accuracy the application of the chlorine to the water system.

In general, approved chlorine feeders operate by injector induced vacuum, measure the chlorine in the gaseous state, dissolve it in water and direct the solution to the main flow of water being treated. Chlorine gas feeders may be controlled manually at set rates of feed, semi-automatically, paced in step with pump operation, or automatically, paced in accordance with main line flow from Venturi, propeller type, Telemeter or summation units, Figure 3. Supplementary instruments used in conjunction with chlorine feeders include those which measure and record the concentration of chlorine in the treated water, those which record the rate of flow of chlorine passing through the chlorine feeder and loss in weight from storage cylinders on weighing scales.

Production of chlorine dioxide is frequently used to control tastes and odors, as a supplement to the sterilization equipment.

## Distribution

The distribution system of a water works includes not only the transmission mains and services and elevated storage tanks, but also the pumps at the service pumping station and any booster pumping stations.

Flow measurement and records by instrument are essential to proper operation of a water works. A comparison of main line flow with the metered volumes sold gives a check on unaccounted-for water, a measure of efficiency of system operations and an indication of leakage loss.

In the main pumping station pump, controls may be of several types, from simple "on-off" or time cycle control, to complex step operation and pressure control. Where an outlying reservoir or elevated storage tank is part of the system, adjustable contacts may be installed in the receiving instrument of a telemeter, to start or stop booster pumps in accordance with changes in storage level. By means of special supervisory equipment, control functions for a group of several such pumps may be handled over a single pair of telephone wires.

Because of the limitations of simple pressure control of pumps, particularly in outlying areas, highly specialized control systems have been developed to control both pressure and flow. This "pressure-flow" system makes it possible to coordinate pressure controls and flow-rate controls to maintain pumpage closely in step with varying demand while maintaining adequate and steady pressure throughout the distribution system.

The drift of population away from urban centers has resulted in the growth of suburban complexes of independent communities, whose water demands may often be economically met from a central source maintained either by the City or an independent authority.

The water needs of such a group may be controlled from a single point by the use of supervisory equipment of the type described above. A case in point is the group of 12 communities north of Dallas, Texas, completely controlled from a station in Wylie. The control panel for this installation is shown in Figure 4.

**FIG. 4. COMPLETE INSTRUMENTATION and Control Panel for Modern Water Purification Plant and Pumping Station.**

### Summary

Instruments and controls are used in many places and for a wide variety of purposes in water works. Table A shows the most common applications of primary devices, instruments and controllers in water works. These are classified according to the purpose or function they serve and are listed by location at which the function is performed.

TABLE A

| TYPE OF INSTRUMENTATION and METER LOCATION | PRIMARY MEASURING DEVICE | | | | | | | | | | | | | RECEIVING INSTRUMENT * | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | MECHANICAL | | | ELECTRICAL or PNEUMATIC | | | TELEMETER | | | CONTROL*** | SUMMATION OF FLOWS |
| | Venturi Tube | Dall Flow Tube | Orifice | Flume | Propeller | Weir | Magnetic Meter | Float | Bubble Pipe | Displacement Meter | Pressure | Rotameter | | T** | I** | R** | T | I | R | T | I | R | | |
| **FLOW MEASUREMENT** | | | | | | | | | | | | | | | | | | | | | | | | |
| Raw Water Intake | x | x | x | x | x | x | x | | | | | | | x | x | x | x | x | x | x | x | x | 1, 2 | x |
| Raw Water Pumpage | x | x | x | | x | | x | | | | | | | x | x | x | x | x | x | x | x | x | 1, 2, 3 | x |
| Effluent from Filters | x | | | | | | | | | | | | | | x | x | | x | x | | | | 1 | x |
| Finished Water | x | x | x | | x | | x | | | | x | | | x | x | x | x | x | x | | | | 2, 3 | x |
| Pumpage to Distribution | x | x | x | | x | | x | | | | x | | | x | x | x | x | x | x | | | | 3 | x |
| Booster Pumpage | x | x | x | | x | | x | | | | x | | | x | x | x | x | x | x | x | x | x | | |
| Wash Water to Filter | x | x | x | | x | | x | | | | x | | | x | x | x | x | x | x | | | | 1 | |
| Wash Water to Tank | x | x | x | | x | | x | | | | x | | | x | x | x | x | x | x | | | | 2 | |
| Plant Water Supply | | | | | x | | x | | | x | x | | | x | x | x | | | | x | x | x | | |
| Chlorine Gas, Ammonia, Sulfur Dioxide | | | x | | | | | | | | | x | | x | x | x | x | x | x | | | | | |
| Chlorine Solution | | | | | | | | | | | | x | | | | | | | | | | | | |
| $CO_2$ Gas | x | x | x | | | | | | | x | | | | x | x | x | | | | | | | | |
| **LOSS OF HEAD** | | | | | | | | | | | | | | | | | | | | | | | | |
| Head loss in Filters | | | | | | | | | | | x | | | | x | x | | | | | | | | |
| **LIQUID LEVEL** | | | | | | | | | | | | | | | | | | | | | | | | |
| Supply Reservoir or River | | | | | | | | x | | | | | | | x | x | | x | x | | x | x | | |
| Settling Basin | | | | | | | | x | x | | | | | | | | | | | | | | 4 | |
| Finished Water Res. | | | | | | | | x | x | | | | | | x | x | | x | x | | x | x | 4 | |
| Distr. Res. or Tank | | | | | | | | x | x | | | | | | | | | | | | x | x | 3, 4 | |
| Wash Water Tank | | | | | | | | x | x | | | | | | | | | x | x | | | | | |
| **PRESSURE** | | | | | | | | | | | | | | | | | | | | | | | | |
| Wash Water | | | | | | | | | | | x | | | | x | x | | | | | | | | |
| Finished Water Suction | | | | | | | | | x | x | x | | | | x | x | | | | | | | | |
| Finished Water Distr. | | | | | | | | | | | | | | | x | x | | | | | | | | |
| **MISCELLANEOUS** | | | | | | | | | | | | | | | | | | | | | | | | |
| Rainfall | | | | | | | | | | | | | | | | | | | | | | | | |
| Surge & Water Hammer | | | | | | | | | | | x | | | | x | x | | | | | | | | |
| Elec. Power | | | Watt-hour Meter | | | | | | | | | | | x | | | | | | | | | | |
| Fuel Oil | | | | | | | | x | | | | | | | | | | | | | | | | |
| Temperature | | | Temp. Bulb | | | | | | | | | | | | x | x | | | | | | | | |
| Chlorine Residual | | | | | | | | | | | | | | | | | | x | x | | | | | |
| PH | | | | | | | | | | | | | | | | | | x | x | | | | 2 | |

* Actuated by transmitter of corresponding type where required

** — T = Totalizer; I = Indicator; R = Recorder

*** 1- Rate-of-Flow Control; 2- Chemical Feeder Control; 3- Pump Control; 4- Liquid Level Control

The requirements of each water works system as to number and types of instruments varies with the nature of the water source, pumping arrangement, treatment necessary and distribution facilities. The selection of a primary device and its companion instrument and/or controller for a particular water works is governed by installation considerations and the application involved. In many cases the selection and installation of the instruments and controllers are engineered and designed to fit the specific problems involved.

The original plant where in 1859 began the . . .

# History of the Hersey Manufacturing Co.

FRANCIS C. HERSEY who with his brother Charles founded Hersey Brothers

■ In 1859, Walter E. Hawes and Charles H. Hersey founded the firm of Hawes and Hersey for the manufacture of rotary pumps, bolts and general machinery. In July of that year Charles Hersey obtained the first of 104 patents assigned to the firm when he designed a rotary pump. Their profit on its first full year of operation, 1860, was $407.50 from the sale of pumps only.

First entry in Ledger No. 1, under the heading of "Bolts and Nuts" on Dec. 1, 1859, was for the sale of 25 pounds of long bolts to a Federal Street, Boston concern.

Francis C. Hersey, brother of Charles, in 1865 was admitted to the firm and in 1872 the two Herseys bought out the interest of Hawes and continued the business under the

CHARLES H. HERSEY, one of the founders of the original firm

THE NEW MANUFACTURING plant

name of Hersey Brothers. The present firm is still managed by the decendents of the original family.

Two old line New England firms, Felton and Sons, distillers, and Jenney Manufacturing Company, both still situated in South Boston, play a part in the early Hersey history. Bernard Jenney, Sr., founder of the oil firm which bears his name, became a director in 1885 and after his death his son, Bernard, continued in the same position. Hersey pumps were used in the oil refinery and many of the early work assignments for Jenney dealt with all types of metal fabrications. Frederic L. Felton, also an original director, served in two vice presidential capacities. After his death his son, Herbert, became a director.

### Early History

Charles Hersey invented a dryer for the drying and refining of sugar and in 1872 the firm commenced the manufacture of sugar, soap and salt machinery. Then, in 1885, based on a patent issued to James A. Tilden of Hyde Park, Mass., the firm started the manufacture of water meters and changed its name to Hersey Meter Company: In 1890 the meter firm purchased Hersey Brothers and the new alliance became the Hersey Manufacturing Company.

Hersey's connection with the sugar industry is significant in that after it started the manufacture of sugar granulators and dryers in 1871, the entire industry was revolutionized and its methods changed. It is safe to assume that every cane sugar refinery in this country and 97 per cent of the beet sugar refineries used the Hersey dryer. Throughout the world wherever finished or refined sugar was processed, Hersey dryers were used. Just prior to 1950, Hersey sold its sugar machine manufacturing rights.

**EDITOR'S NOTE: A century of manufacturing tuned to the nation's progress is the milestone reached this year by the Hersey Manufacturing Company of Dedham, Mass.**

**Along with Hersey 1859 hailed the introduction of the first commercial oil well; first Pullman sleeping car; first rotary washing machine, and the first electric light for household illumination.**

**The company, a completely integrated water meter manufacturing firm, just recently re-located its administrative, production and research facilities in a modern building on a 10-acre tract of land along fast-growing Route 128 (the major circumferential highway around metropolitan Boston) in suburban Dedham. For the past 50 years of its existence it occupied the same group of buildings which evolved from a tiny machine shop on the shores of Boston Harbor in South Boston.**

### Expanding Meter Business

The history of water meter manfacturing in the United States is covered in the past 100 years. Of that period, Hersey has been a meter manufacturer in all but 24 years. During the years 1870 through 1900, there were more patents recorded for water meters in the U.S. patent office than for any other purposes. Most all, save a handful, died a natural death.

The machine shop in South Boston grew in size as did the business. Following the success of the Tilden-patented rotary meter in 1885, the firm manufactured and sold many types, aided by its reputation and the series of housing booms which spread throughout the country.

A modern day merchandising technique was employed by Hersey in 1886, one year after it started the manufacture of the ⅝" rotary type. The firm wrote to water superintendents throughout the nation enclosing a descriptive circular and offering to supply a free meter for trial purposes. The success of this technique was proven by the distribution pattern and number of sales four years later. In 1889 the company's meters were in operation in communities of 35 states, three territories (Dakota, Washington and Montana) and Canada. In Massachusetts alone, 51 cities and towns were using Hersey meters.

The first of many to follow, test book No. 1, shows how quickly the firm's meter was accepted. It lists: Nos. 1 and 2, shop; No. 3, Wellesley Hills, Mass.; Nos. 4 and 5, patent offices, Canada and the United States; No. 10, Jenney Manufacturing Company, Boston; No. 15, Boston Water Works; No. 16, Boston City Hall; No. 17, City of Newton, Mass.; No. 39, St. John, N. B.; No. 59, Melbourne, Australia.

In 1905 Hersey patented a revolutionary type of fire service meter using three units in combination. Water woks officials hailed this development as a meter which met all requirements set by insurance companies and which served to set the standards for the industry.

As sales increased, and production

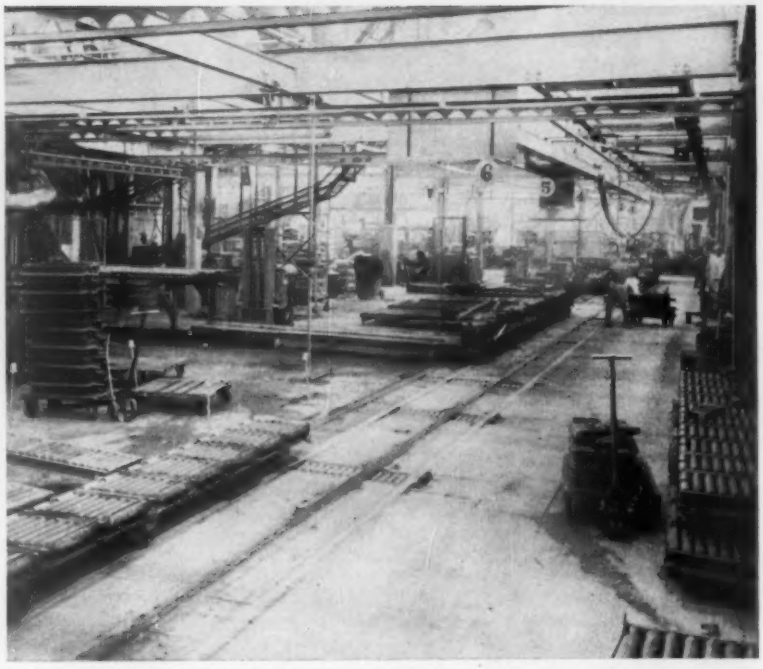
of meters threatened to strain the brick walls of the old buildings in South Boston, it became apparent that manufacturing conditions were far from ideal and efficiency of operation duly suffered. Among the contributing factors to this situation were the location of a bronze foundry on the fifth floor; all manufacturing and shipping phases serviced by one elevator, and the annual purchase of 15,000,000 gallons of water from the City of Boston for testing purposes.

### New Manufacturing Facility

In 1956 the company's management team sought a new manufacturing site. At the same time, they planned a custom-built manufacturing operation utilizing the newest of factory and machine shop techniques, together with a highly-mechanized bronze foundry.

Winthrop P. Hersey, president, points out that the firm needed a modern, efficient plant so that it could be prepared to meet the anticipated growing need for water meters of all types which it expects in the 1960's.

Construction on the new site began in 1956 and was completed in the Summer of 1957. The 150,000 square foot building, constructed by Aberthaw Construction Company of Boston, is strategically located at the junction of Route 1 and 128. The building was custom designed to Hersey's specifications by Cabot, Cabot and Forbes Company, Engineering Division, for the complete manufacture of a full line of water meters. The building contains 12,000 square feet of air conditioned general and executive office space. A complete description of the company's manufacturing facilities was reporting in Water & Sewage Work last year (Vol. 105, No. 1, page 25-27, 1958).



MECHANIZED FOUNDRY facilities at the new Hersey Plant

With an eye to the future, Hersey's engineers designed the entire testing section in an effort to provide testing and research. Outstanding maximum opportunities for unlimited features of the department are the special devices and work sequences which enable the test personnel to quickly change meters from one size to another on the same test bed. Here, the largest meter up to and including 12 inches can be inspected and run under actual conditions.

Hersey's normal water supply comes from the local water works company. However, to provide unlimited water for testing, Hersey dug its own 120-foot well adjacent to the testing section.

A West Coast branch plant, located in Monterey Park, near Los Angeles, is active in the field of volumetric and flow testing of equipment for jet aircraft fuel. Branch sales offices are located in New York City; Portland, Ore.; Philadelphia, Penn.; Atlanta, Ga.; Dallas, Texas; Chicago, Ill.; and San Francisco, Calif.

Walter A. Hersey, president since 1924, assumed the chairmanship of the board last year. His older son, Winthrop P., became president and another son Francis P., is vice president and treasurer. A grandson, Peter H., son of Francis, last year joined the firm as a trainee.

## N. Carolina House Passes Water Resources Bill

A bill providing for the creation of a new State Department of Water Resources was passed by the North Carolina House of Representatives and sent to the State Senate.

The report explained that water functions now carried out by various agencies would be consolidated by the bill under the new department.

These functions include those of the State Conservation and Development Department's Division of Water Resources, Inlets and Coastal Waterways and groundwater research activities of C&D's Division of Mineral Resources.

The State Stream Sanitation Committee also would be transferred to the new department but would retain "exclusive jurisdiction" over stream classification until July 1, 1965.

Ae seven-member board named by the governor would govern the new department, whose administrative head would be a director.

". . . and you said we don't need a new sewer system. Do you still think we don't need one now?"

Part 14 of this series on centrifugal pump design, construction and maintenance discusses

# Couplings

by IGOR J. KARASSIK, Consulting Eng. and Manager of Planning, Harrison Div., Worthington Corp., Harrison, N. J.

**EDITOR'S NOTE: Coupling of the driver to a pump for proper transmission of power from shaft to shaft can be a most important part of any pumping installation. Allowance in design and installation for minor discrepancies, as well as for ease and access in maintenance, makes proper selection of coupling type and size a must. Some of the fundamentals involved are discussed by the author.**

■ EXCEPT FOR close-coupled units, in which the impeller is mounted on on extension of the shaft of the driver, centrifugal pumps are connected to their drivers through couplings of one sort or another. Couplings can be of either rigid or flexible types. A coupling which permits neither axial nor radial relative motion between the driving and the driven shafts is called a rigid coupling. It connects the two shafts solidly and, in effect, makes of them a single shaft. Primarily, the use of rigid couplings is restricted to vertical pumps.

On the other hand, a flexible coupling is a device which connects two shafts and which is capable of transmitting torque from the driving to the driven shaft while allowing for minor misalignment (angular, parallel, or a combination of both) of the shafts. Contrary to popular conception, although flexible couplings take care of such slight errors in alignment in emergencies, misalignment is undesirable and should not be tolerated permanently. Misalignment causes whipping of the shaft, adds thrust to the pump and driver bearings, and in general leads to excessive maintenance and potential failure of the equipment.

A flexible coupling must also permit some lateral float of the shafts, so that the two shaft ends may move closer together or farther apart under the influence of thermal expansion, hydraulic float, or shifting of magnetic centers of electric motors, without introducing excessive thrusts on the bearings. This specific phase of flexible coupling design will be discussed in greater detail subsequently.

## Rigid Couplings

The clamp coupling (Figure 1) is a typical rigid coupling. It consists basically of a split sleeve provided with bolts so that it can be clamped on the adjoining ends of two shafts and form a solid connection. Both axial and circular keys are commonly incorporated in the clamp coupling so that the transmission of torque and thrust is not made solely dependent on the frictional grip.

A compression coupling (Figure 2) is likewise essentially a rigid coupling. The central portion of the coupling is made up of a slotted bushing, to fit the two shafts and taper-machined on its outside diameter from the center out to both ends. The two coupling halves themselves are finish bored to suit this taper. When drawn together by bolting, the bushing is compressed to the two shafts

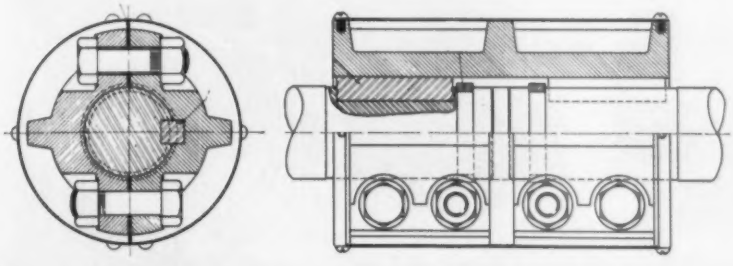


Fig. 1. CLAMP coupling.

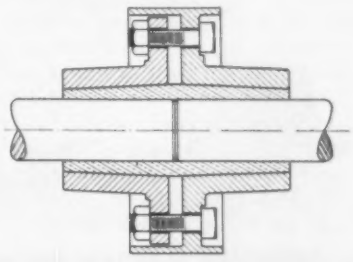


Fig. 2. COMPRESSION coupling.

and the frictional grip transmits the torque without the use of keys.

## Flexible Couplings

### Pin and Buffer Couplings

A pin-and-buffer coupling is a flexible coupling having pins attached to one-half of the coupling projecting into buffers mounted in the half of the coupling on the other shaft (Figure 3). The buffers are made of rubber or other compressible material to provide the necessary flexibility. The driving bolts have an easy sliding fit in the bushings; therefore, slight longitudinal variations are taken care of by the sliding action of the bolts within the bushings, while slight errors in angularity are compensated by the flexibility of the rubber.

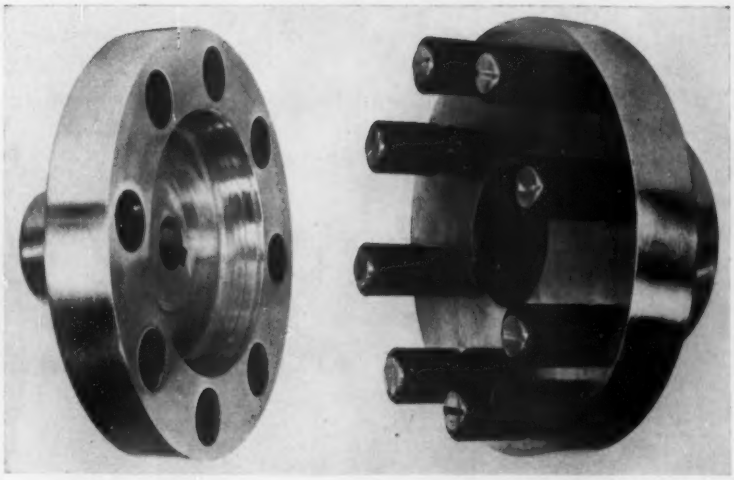


Fig. 3. PIN-AND BUFFER coupling.

The Lovejoy coupling shown in Figure 4 is actually a modification of the pin-and-buffer coupling principle. It consists of two flanged hubs mounted on the driving and driven shafts, respectively, with lug projections or jaws in the flanges. These jaws mesh with a central flexible element in the form of a spider (generally made of rubber) which absorbs minor misalignments and vibration.

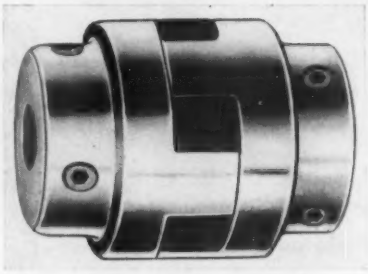


Fig. 4. LOVEJOY-type coupling.

### All-Metal Flexible Couplings

An all-metal flexible coupling is one in which all parts are made of metal. Some of these depend on the flexibility of metal plates or springs; others depend on the angular displacement possible with a spline and consist of two splines with a connecting splined sleeve.

The gear-type "fast" flexible coupling is illustrated in Figure 5. In the outer shell of the coupling, inside each end, there is a ring of internally cut gear teeth which mesh with the gears on the driving and driven halves of the coupling, respectively. The torque is transmitted through the gear teeth, while the permissible sliding action and ability for slight adjustments in position is provided by a certain freedom of action between the two sets of teeth. To prevent any tendency to bind due to friction, the gears work in a constant bath of oil retained within the outer shell. In some high-speed applications, light grease is used to provide the necessary lubrication.

Another type of all-metal coupling is the Falk flexible coupling. (Figure 6), which consists of two flanged steel hubs, a special tempered steel spring forming a complete cylindrical grid, and a steel shell cover. The peripheries of the hubs are slotted to receive the spring member. The slots widen inwardly toward each other. This widening is in the form of an arc, bearing a definite relation to the thickness of the grid spring bars. The curvature is such that the points of support approach each other as the load increases. In fact, the slots are so formed that the stress on the spring members remains almost constant throughout the entire elastic range of the coupling. This coupling is grease lubricated.

The Thomas coupling, shown in Figure 7, is a non-lubricated all-metal flexible coupling made up of two hubs mounted, respectively, on the driving and driven shafts, and a central flange connected to the flanges of the two hubs through a series of flexible discs. Power is transmitted in tension by the flexible discs, which are bolted alternately to the end flanges and to the center member. The flexing of the discs compensates for the misalignment.

There are, of course, numerous other types of all-metal flexible couplings and the three types illustrated here are given as general examples.

### Limited End-Float Travel

Horizontal sleeve bearing electric motors are not generally equipped with thrust bearings, but are merely provided with babbitted faces or shoulders on the line bearings. The motor rotor is allowed to float and,

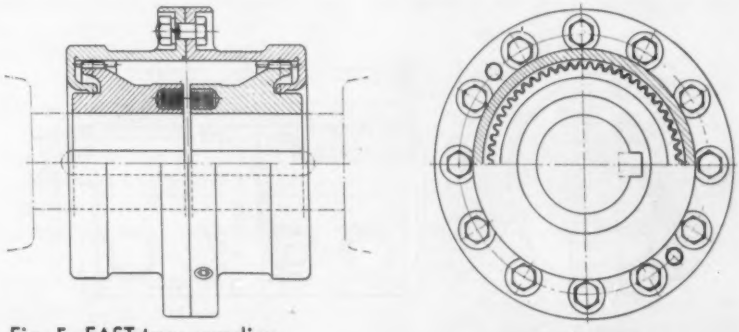


Fig. 5. FAST-type coupling.

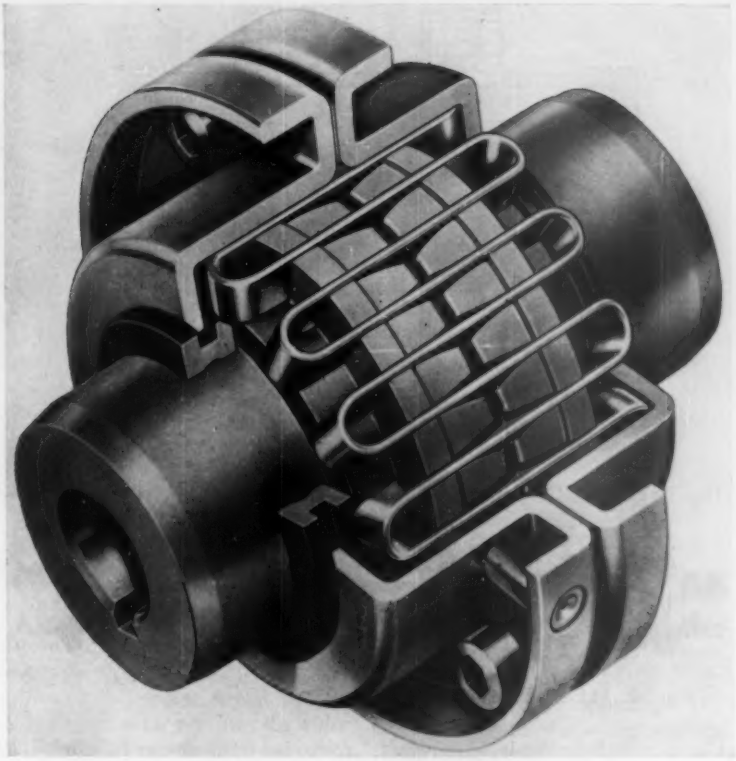


Fig. 6. FALK coupling.

Fig. 7. THOMAS coupling

while it will seek the magnetic center, a rather small force can cause it to move off this center. This movement may, in some cases, be sufficient to cause the shaft collar to contact the bearing shoulders, causing heat and bearing difficulties.

This is particularly true of large electric motors of 200 hp and higher. Since all horizontal centrifugal pumps are equipped with thrust bearings, it has become the practice to use "limited end-float" couplings between pumps and motors in this size range. These couplings keep the motor rotor within a restricted location. The motors are built so that the total clearance between shaft collars and bearing shoulders is not less than ½ in. In turn, the flexible couplings are arranged to restrict the end float of the motor rotor. The restriction against closing the gap is provided by one of the following methods:

a) *For gear-type or grid-type couplings*: by locating a "button" at the end of the pump shaft or by inserting a predimensioned plate between the two shaft ends.

b) *For the flexible-disc type such as the Thomas coupling*: by the stiffness of the flexible discs themselves, which, have inherent float restricting characteristics.

Contact between the hubs and the coupling covers prevents excessive movement in the opposite direction for gear-type or grid-type couplings. The stiffness of the flexible discs is the restraining force in both directions in the case of the Thomas couplings.

#### Floating Shaft Couplings

Regular flexible couplings are made to connect driving and driven shafts whose ends are relatively close to each other and are suitable for limited misalignment. In some cases provision has to be made for greater misalignment. In other cases the ends of the driver and pump shafts have to be separated a considerable distance for some reason. This is the case, for example, of end-suction pump designs in which the rotor and bearing assembly is removed by withdraw-

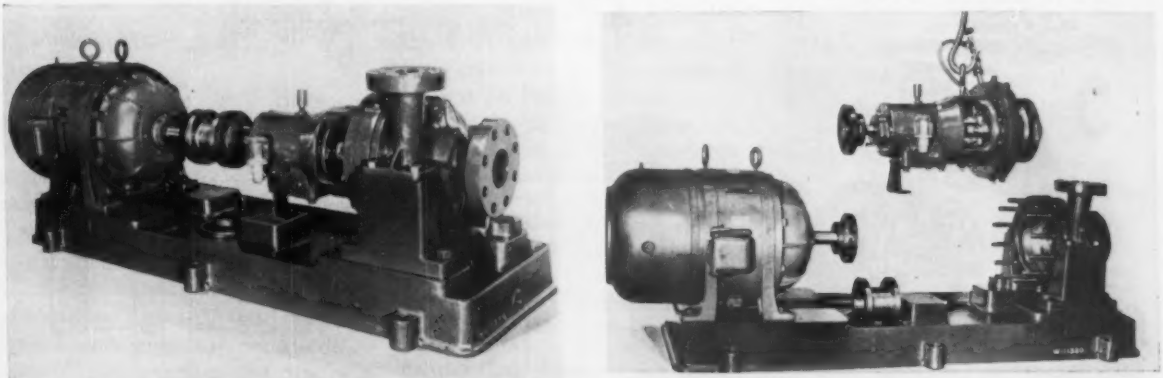


Fig. 8. AN EXTENSION-type coupling enables a pump to be dismantled without moving either the driver or the pump casing.

ing it axially toward the driver. If neither the pump nor the driver can be readily removed, it becomes desirable to separate the driver and pump shaft ends sufficiently to allow withdrawal of the pump rotor and a readily removed flexible drive of sufficient length is necessary (see Figs. 8 and 9).

The extension or spacer sleeve-type coupling is commonly used on pumping units handling hot liquids, where expansion may result in misalignment. Their purpose is to protect against considerable misalignment with a minimum separation of the driving and driven shaft ends. Usually this type consists of two single engagement elements connected by a sleeve (Figure 9).

The floating shaft type consists of two flexible elements connected by a shaft which must be supported on each end and the flexible elements must provide for this support. Different manufacturers use different designs as required by their basic coupling designs. For instance, each of the two couplings may be of the single engagement type, may consist of a flexible half-coupling and rigid half-coupling at each end, or may be complete flexible couplings with some piloting or guiding construction.

In the smaller horsepower field (below 25 hp per 100 rpm) "flexible drive shafts" are commercially available. These use universal joints at each end with a tubular floating shaft and a splined portion to provide for length variation (Figure 10).

The floating shaft and flexible drive shaft types find considerable application with vertical dry pit pumps. Specific discussion of this application will be made later when that type of pump is discussed.

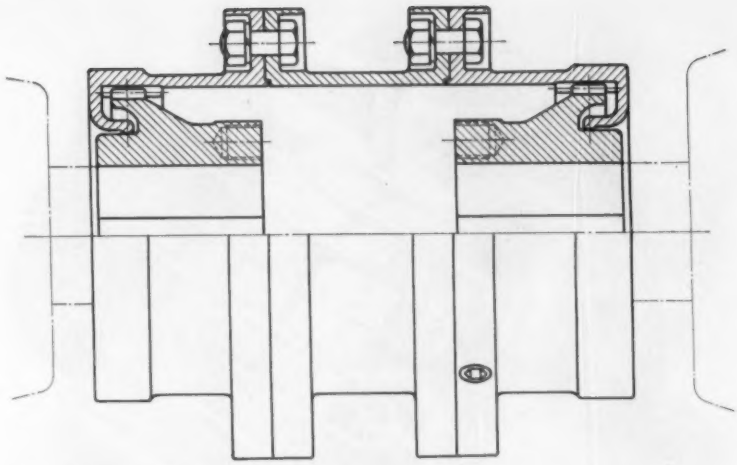


Fig. 9. EXTENSION-type coupling.

Fig. 10. FLEXIBLE drive shaft.

### Clutch-Type Couplings

Regular disc-type clutches are rarely used to connect a centrifugal pump to its driver for two major reasons. The first is that most clutch designs impose a high additional thrust load on the pump thrust bearing; the second, that very accurate alignment between the clutch parts is necessary, but is most difficult to maintain. The over-running clutch design has been used to connect drivers to pumps, particularly for dual-driven units, and the most successful designs have a flexible coupling incorporated into the clutch unit. A clutch-type coupling utilizing faced weights which are contained in the driver half and which are pressed against a drum surface on the driven half by centrifugal force, is also used.

### Couplings for Dual Drive

In dual-driven pump installations, it is generally desirable to have one driver idle, either to save power or to save wear on the idle machine. In the case of internal combustion engines, the engine cannot be allowed to turn over idle and must be disconnected. The ideal type of couplings for such units are those which can be readily disengaged and engaged.

An example of the chain-type quick-disconnecting coupling is shown in Figure 11.

Another type of cut-out coupling is

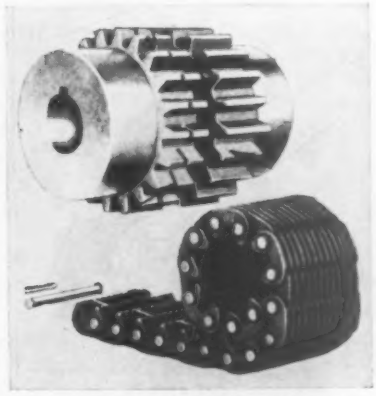


Fig. 11. CHAIN-TYPE Coupling (quick-disconnect).

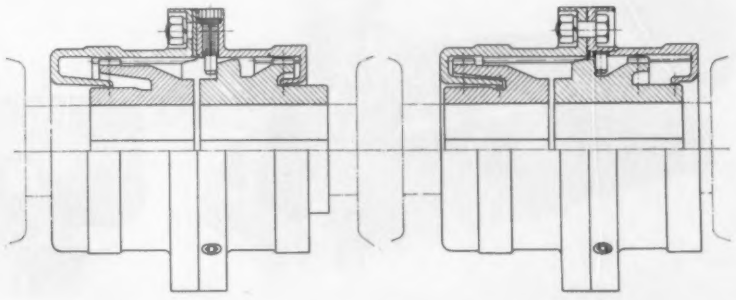
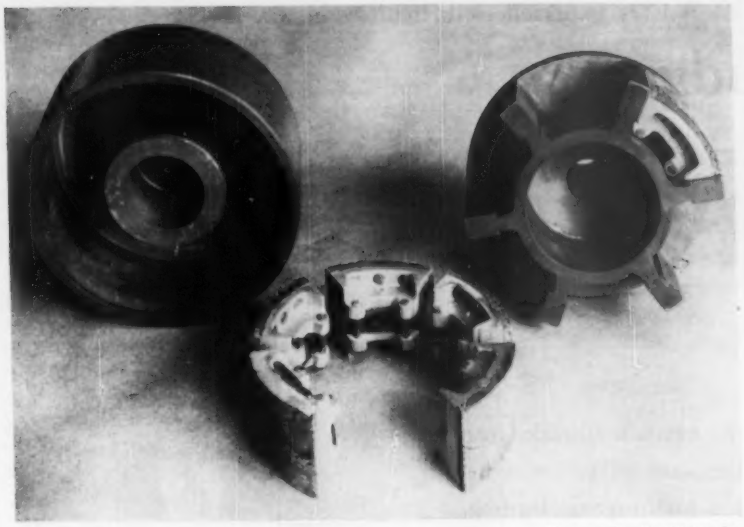


Fig. 12. FAST-CUT-OUT-type coupling; connected (left) and disconnected (right) positions.



Courtesy Centric Clutch Co.

**Fig. 13. CLUTCH-TYPE coupling.**

illustrated in Figure 12. It is a quick and simple operation to release the location pins, slide the sleeve into or out of engagement, and thereby connect or disconnect the driving unit and the pump.

Where time is of extreme importance or when the starting of the standby driver is automatically controlled, a device of the free wheeling clutch type is necessary. Very suitable for this service is a clutch-type coupling with spring-retained shoes in the driver half of the coupling (Figure 13). The centrifugal action on these shoes can be controlled to any predetermined speed and no engagement of shoes takes place until this speed is reached. Above this speed, the coupling automatically picks up the load. The spring tension can be made just sufficient to overcome the weight of the shoe or may be sufficient to allow a pump to be driven by a motor on one side while an internal combustion engine is idling without carrying any of the load on the other side. Bringing the engine up to speed engages the coupling.

### Coupling Guards

Coupling guards are stationary enclosures surrounding couplings. Their basic function is to protect the operator from the possible danger of getting caught by the revolving coupling. They are usually made of steel mesh or steel plate and are fastened to the bedplate, or to the pump foundation in the absence of a bedplate. They are desirable in many cases and actually mandatory in some localities.

## Current Measurements Report

The California State Water Pollution Control Board has announced the release of their publication No. 19 entitled "Investigation of Current Measurement in Estuarine and Coastal Waters." This report was prepared for the board by J. W. Johnson, Professor of Hydraulic Engineering, University of California at Berkeley.

The general objective of this report is the analysis and evaluation of existing and potential systems for measuring currents in both coastal and estuarine waters, as such currents relate to the movement, transport and dispersion of discharged waste waters.

Characteristics of both currents and measuring devices are reported on in detail by Professor Johnson and his associate Mr. R. L. Wiegel. Main topics covered are: general character of ocean currents, determination of coastal and estuarine currents, rotating element current meters, drift type current measuring systems and position surveying, miscellaneous types of current meters, and data recording and analysis. In conclusion, procedures are summarized and types of equipment to be used are suggested.

Because of the extensive use of coastal and estuarine waters for the disposal of sewage the collection of this information is a definite contribution. Details are presented on the suitable measuring equipment and methods and an extensive body of references on the subject is listed. This publication should be in the library of everyone involved in design and operation of outfalls. Single reference copies are being furnished to governmental officials and agencies directly concerned with coastal water pollution control and related fields, to educational institutions and libraries, and to individuals and organizations that participated in the research project. Others may purchase copies from the State Printing Division, Documents Section, Sacramento 14, California, at a cost of $1.75 per copy. This cost includes shipping charges but not the $0.07 sales tax which must be added for California addresses. Remittance must accompany orders.

## Compacting Improves Sewage Sludge

Preliminary pilot plant operation has begun at the City of Baltimore sewage-treatment plant to improve the physical characteristics of heat-dried sewage sludge, which is sold to fertilizer companies as a base for fertilizer. The granulated sludge will be of uniform size and density, flow freely and contain little dust.

A compacting mill has been installed at the plant to compact dusty and finely sized material from flash drying equipment between two rolls into a solid sheet and prepare it for subsequent granulation so that the final product will be relatively free of dust.

The pilot plant will be used to investigate variations in feed characteristics to the Allis-Chalmers compacting mill before going into full scale production. To operate the commercial size "Compactor" on a pilot plant scale, a speed reducer slows the machine sufficiently to process test quantities of several hundred pounds per hour. After being changed to full scale production, the plant will turn out about 50 tons of dried sludge per day with greatly improved physical characteristics.

* * *

Municipal plant receiving Industrial Wastes experiences difficulties in . . .

# Dewatering Sludge

by WALTER C. ANDERSON, Supt.
Sewage Treatment Plant, Cranston, R. I.

EDITOR'S NOTE: Sludge dewatering by vacuum filtration can be a problem when a major portion of the plant influent contains troublesome industrial wastes supplying a high organic loading. An example of an installation which experienced difficulties of this type is the Cranston, Rhode Island Sewage Treatment Plant. At Cranston, wastes from a large brewery and a large print works were admitted in addition to the normal domestic and industrial load. This inclusion resulted in a poorer operation throughout the plant. The vacuum filter performance was quite noticeably affected in that cake rates decreased, chemical dosage increased, and media blinding was more pronounced. It was only after many years of testing various types of filter media and methods of cake discharge that acceptable filter operation was achieved.

■ THE CRANSTON TREATMENT PLANT was placed in operation March 2, 1942 and was designed for a maximum flow of 7.67 mgd. The treatment plant is modern in every respect and provides complete treatment by the activated sludge process. It includes units for grit removal, comminution and screening, grease removal, primary settling, aeration, final settling, chlorination, and sludge treatment, including concentration, digestion, elutriation, and vacuum filtration followed by sludge drying or incineration. The plant was designed by Fay, Spofford and Thorndike, Consulting Engineers, of Boston, Mass. The plant was estimated to have an average daily flow of 5.5 mgd. and a corresponding equivalent population of about 60,000, based on B.O.D. Of this latter amount, it had been estimated in the design calculations that the industrial waste equivalent would be about 16,000. The basis for this assumption was that it was believed the local manufacturing establishments would reduce the organic load of their wastes 20 per cent by pre-treatment before discharging their effluents to the City sewer system. However, it was soon established that the total industrial load was too much for the municipal treatment plant to handle.

When the Cranston Plant was placed in operation, only domestic sewage was received and all units functioned satisfactorily. The average results obtained during the initial operating months showed an organic load reduction of about 87 per cent and a suspended solids reduction of 85-90 per cent. When brewery wastes were added to the domestic load in June of the same year, the average influent B.O.D. increased from 200 mg/L to about 900 and tended to fluctuate during the day between 15 and 250 per cent, dependent on the brewery operation. Soon, the treatment plant reduction of B.O.D. had fallen to about 30 per cent and only a 70 per cent reduction in suspended solids was realized.

Later in the year a print works (washing, bleaching, dyeing, and printing of cloth) added its wastes to the sewers, tripling the influent volume. The raw sewage became highly alkaline from the textile waste addition and the average suspended solids dropped to about 300 mg/L. It was hoped that the mixture of the two wastes would counteract each other due to a difference in pH. However, no beneficial results ensued. In fact, the digester gas production dropped to one-third of the volume obtained prior to admission of these industrial wastes.

The following is an account of the experience at Cranston with vacuum dewatering of the difficult sludge resultant from the inclusion of high volumes of industrial wastes with high organic loading.

## Early Sludge Filtration

The Cranston Plant was equipped with two Eimco 8 x 8 ft rotary drum vacuum filters, each of 200 sq ft in area and fitted with a wool blanket. After the filtration step, the sludge solids were to be incinerated. However, the filter cake was used as land fill on the plant site, since land space was available incinerator fuel savings could be realized.

It was anticipated by the engineers that the filters should produce a cake rate of 4 psf per hour on the elutriated-digested sludge. Before the inclusion of the brewery and print works wastes, the filter performed better than expected. With a feed solids of approximately 6 per cent by weight, the cake rate was 5 psf per hour based on a 3.5 per cent ferric chloride dosage. The cake moisture was about 75 per cent, which is considered lower than average for an elutriated-activated-digested sludge. Thus, it was evident that the filter operation was excellent under normal design operation.

However, beginning in the summer of 1942, when the brewery wastes were admitted into the city sewer system, the filtration rate started to drop and the chemical requirement for conditioning began to increase slightly. This can only be attributed to the fact that the volume of industrial waste was too great for the plant to handle. With brewery wastes alone, the filter production decreased to less than 3 psf per hour and the ferric chloride dosage increased to over 6 per cent. When the textile wastes were added to the load, trouble with digester operation was encountered, and drawn sludge was only partially digested. This caused the rates to decrease even further.

The city finally stopped accepting the print works' wastes early in 1943, which aided the operation to some extent. Then, in 1949 the brewery wastes were diverted into the Providence sewer system and plant operation immediately improved. As an indication, the average annual B.O.D. of the treated sewage, after stopping the brewery waste treatment, dropped from about 200 to 29 mg/L. Thus, it was apparent that the brewery wastes should not have been admitted to the Cranston plant without some form of control and pretreatment.

After the industrial waste load had been relieved, filter performance improved to the point where it was considered fairly good. However, operational troubles appeared in digester operation which ultimately had their effect on the filters. During 1950-51 there was considerable difficulty in obtaining a digester supernatant of sufficiently low solids concentration. Oftentimes the supernatant solids concentration had been as high as 1.5 per cent which placed a considerable load on the primary settling tanks. In order to relieve this load, experiments on different methods of digester operation were made during the years 1951 and 1952. The best solution to the problem appeared to occur when the digesters were operated as a single stage unit. Then, only the top-level supernatant from this digester was transferred to the "second" digester. Finally, the top-level supernatant from the "second" digester was returned to the primary tanks while the concentrated underflow was filtered. As the supernatant obtained by this method of operation contained only 0.5 per cent solids, the primary tanks were operated with little efficiency loss.

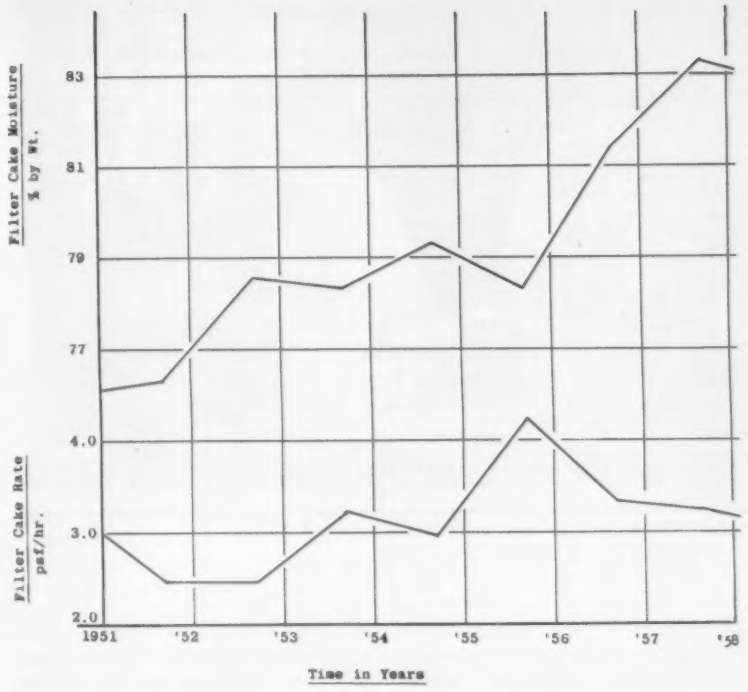



**Fig. 1. FILTER performance at Cranston, R. I. Cake Rate and Cake Moisture for years 1951-'58.**

The effect on the filters due to the low solids concentration of the digested sludge was quite pronounced. This effect is readily apparent in Figure 1, which is a graph of filter performance as depicted by cake production and cake moisture during the years 1951-7. As can be seen from this graph, in 1951 and 1952 the filtration rate dropped from a early average of 3.2 psf per hour to about 2.5 psf per hour, and the average cake moisture began to rise sharply due to higher cake moistures obtained when filtering the concentrated supernatant sludge.

Then, in 1953 an attempt was made to increase filter performance by elutriating the supernatant from the digester in order to de-gas and concentrate it before pumping to the "second" digester. The solids content of the top-level supernatant from the second digester remained at the acceptable level of 0.5 per cent and the quality of the sludge in the underflow was aided by this operation change. As shown in Figure 1, the average filtration rate increased by 32 per cent and the cake moisture decreased slightly indicating that the filterability of the solids was greatly improved. In addition, the ferric chloride dosage was reduced by 24 per cent on a dry basis, thereby lowering operating costs considerably.

### Textile Waste Addition

During the iterim between 1943

Table I
A Comparison of Media Tested at Cranston, R. I.
1954-1957

| Medium Used | Date Tested | Medium Life | Cake Discharge | Rate on Elt.—Dig. Sludge |
|---|---|---|---|---|
| Long-nap Wool with scraper | Installed | 700 hr.* | Fair | 3.11 psf/hr. |
| Cotton Flannel with scraper | 1954 | 400 hr.* | Fair | 3.11 psf/hr. |
| Polyethylene with scraper | 1954 | Blinded | — | — |
| Saran with scraper | 1954 | Blinded | — | — |
| Nylon with scraper | 1954 | Blinded | — | — |
| String discharge Filter | 1955 | — | Good | 2.6 psf/hr. |
| Rotobelt (Woven S.S. belt) Pilot Unit | 1955 | — | Excellent | 6.2 psf/hr. |
| Rotobelt type Plant Unit Test Run (Spring 1957) | 1957 | 10 years (guaranteed) | Excellent | 5.26 psf/hr. |
| Napped Dacron-String Discharge Test Runs (Spring 1957) | 1957 | 1400 + hr.** | Good | 3.33 psf/hr. |

** Acid cleaned every 400 hours with 8% inhibited HCI
* Acid cleaned occasionally

and 1953, pilot plant tests had been undertaken to determine feasibility of handling the print works wastes on high-rate trickling filters in addition to the domestic load and the brewery wastes. The results of the tests indicated that trickling filters would do a satisfactory job under given conditions of flow and pretreatment of the textile wastes. However, no further development of this project occurred.

Meanwhile, the print works were continuing to dump their effluent wastes into the relatively small Pocasset River, thereby contributing to much of its pollution load. The State Department of Health finally asked that better treatment of the textile wastes to be provided to correct the pollution of this river. Thus, in 1953 the City investigated the possibility of treating part, or all, of the textile wastes following primary settling at the print works. It was believed that the treatment of the textile wastes might be accomplished more easily since the annual domestic flow had increased from 364 to over 1100 mil. gal. This would help dilute the industrial waste flow before it entered the treatment plant.

Accordingly, a portion of the worst wastes including dye house wastes, kier liquors, print shop wastes, color shop wastes and toilet wastes were discharged into the city's sewers. It had been established previously that one source of trouble in treating industrial wastes was the erratic flow conditions resultant from the industrial plant operation. Consequently, the print works agreed to discharge their wastes to the sewers at a preestablished, continuous rate. The textile waste volume to the sewers was slowly increased to 700,000 gpd, which did not upset the operation of the Cranston treatment plant. However, it was found necessary to increase the air requirements per volume treated to the aeration tanks and increase the chlorine requirements per volume treated for the final effluent in order to provide satisfactory treatment.

Even with the Cranston treatment plant handling this amount of textile

Fig. 2. ROTOBELT trailer unit filtering Cranston elutriated-supernatant sludge.

wastes, the condition of the Pocasset River did not improve to the satisfaction of the State Health Department. The quantity of industrial waste was increased until it represented 26 per cent of the total influent volume. At this level, no serious problems with plant operation were encountered. Then, in June of 1954, the total volume of textile wastes treated was increased to 47 mil. gal. a year (1.56 mgd) in an effort to relieve the load on the Pocasset River during the reduced river flow through the hot, dry months. This quantity represented 34 per cent of the total monthly flow and over 60 per cent based on the equivalent B.O.D. load. The effect of this increased load again required an increase in the air requirements for the aeration tanks and a 500 per cent increase in the chlorine demand for final effluent treatment. The plant effluent suspended solids content increased from 15 to 48 mg/L and the B.O.D. increased from 16 to 44 mg/L.

Also, an apparent decrease in the operating efficiency of the digester was noted as indicated by a gradual reduction in gas production, until finally the digester was taken out of service. The source of trouble was traced to a green dye waste. The partially digested sludge was filtered causing a large reduction in cake rates and an increase in moisture content. This is apparant from Figure 1, as the yearly cake rate average was lowered 9 per cent from the previous year's results-due in the main part to the trouble experienced with the textile wastes in June, 1954.

The textile wastes were diverted from the sewers until the digesters could resume normal operation. The wastes were again admitted until the flow reached the 26 per cent by volume amount, which could be handled without too much trouble.

### Vacuum Filter Improvements

During the years 1954-7, various media were tested on the filters to determine the optimum cloth for the Cranston sludge. The cloth used up to this time had been a long nap wool blanket which lasted about 700 hours before it had to be changed. New blanket cost was about $100.00

each. In an effort to investigate every possibility, a complete range of the cloths used in the industry was tested, including polyethylene, nylon, saran, and cotton.

Table I provides a comparison of the test run results for all media tested. Media life, cake discharge, and cake rate were used as comparison gauges. These test runs were of varying duration, the data collected represents the results obtained during the test runs and should not be confused with overall operating data shown in Figure 1. As shown in Table I, the only cloth of the group tested in 1954 that approached the performance of wool was cotton flannel. Since the cotton blankets cost only $25.00 apiece, the relative economics of using cotton were apparent. The life was over half as long as wool but the price was only one-quarter of the price of wool. However, both had to be acid-washed frequently to reduce blinding.

In 1955, a decided improvement was made in the filter operation by the installation of a string discharge mechanism on one of the filters. The string discharge made it possible to discharge the cake more completely, thereby eliminating the smearing of cake solids into the cloth by the scraper (A scraper is not used with the string discharge mechanism). The more complete discharge increased the cake production, and the elimination of smearing reduced the blinding tendencies. Moreover, the reduction of blinding permitted a slightly higher vacuum to be pulled across the cake, resulting in higher rates and lower cake moistures.

In August 1955, a trailer-mounted filtration unit equipped with a pilot plant size Rotobelt type filter was brought to the plant by The Eimco Corp. Several tests were made on various types of sludge such as elutriated-supernatant, activated-digested, and elutriated-activated-digested to determine if the Rotobelt could improve the filtration operation when compared to the drum or string filters in the plant. Figure 2 shows the Rotobelt trailer unit in operation at the Cranston plant.

As seen in Figure 2, the cake discharge on the pilot Rotobelt was complete and the cake itself was firm, indicating that the moisture was comparable with the plant filters. Also, with the aid of the back washing feature of this unit, no medium blinding could occur and consequently the cake production was quite high on this pilot installation—averaging about 6.2 psf per hour for the elutriated-supernatant sludge. The plant string discharge filter could produce only 2.6 lb/sq ft/hour when operating on the same sludge. The operational difference between the two types of filters was partially due to an improved method of flocculating the sludge as used by the trailer personnel; however, it was believed that the main difference lay in the ability of the Rotobelt to continuously maintain a non-blinded medium for filtration by back washing. As a result of these tests, the second drum filter was converted to an 8′ x 8′ Rotobelt in February, 1957.

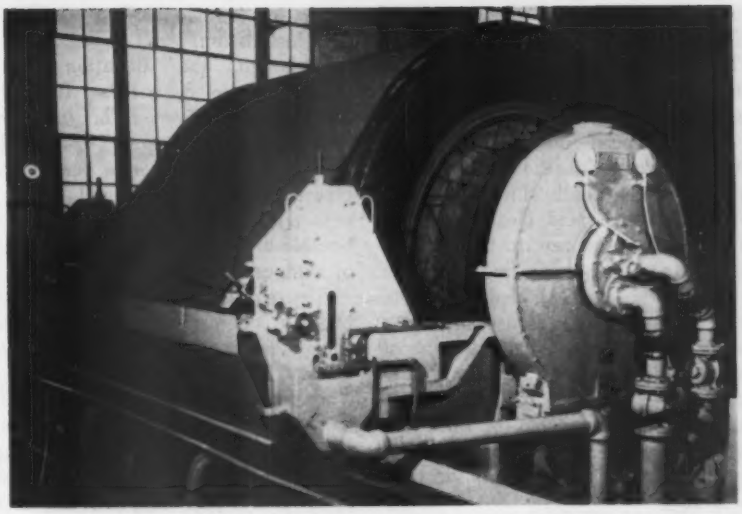


**Fig. 3. PLANT Rotobelt filter dewatering Cranston difficult to filter sludges.**

Prior to the installation of the plant Rotobelt a napped dacron cloth that had demonstrated excellent results in other treatment plants was tested on the string discharge drum filter. Immediately it was apparent that the cake discharge was improved due to less stickiness between the cloth and the cake solids. This resulted in a slight increase in rate when compared to the other cloths tested. Also, as summarized in Table I, the dacron cloth has the longest life of all cloth media tested. It thereby demonstrates its major advantage by saving the labor cost of about two dollars per hour and machine down time involved in the 25 man hours job normally required to change covers on a drum filter.

The dacron cloth has lasted 1400 hours to date and appears as good as new. Although the cloth has to be acid-washed about every 400 hours with an 8 per cent inhibited hydrochloric acid to remove the blinding conditions present, this operation is by far the best of all cloth media tested at the Cranston plant.

### Plant Operation

As pointed out above, the quality of the sludge handled is poor because of the content of industrial wastes in the sewage. Very little good digested sludge is obtained for dewatering. In general, the sludge to be dewatered is an elutriated supernatant liquor thickened to about 3.5 per cent dry solids.

The Rotobelt conversion of filter No. 2 was made in February 1957 and completed during that spring. As reported in the Cranston Annual Report for the year ending Sept. 1957, the Rotobelt attachment was in operation only a short time that year "so that operating data is incomplete. It does appear to result in greater filter production at a steady constant rate." No comparative data were collected on the two types of filters so the effect of the Rotobelt

operation on the total plant output of filter cake is not apparent for 1957. The average yield of sludge cake for the entire year, 1957, decreased slightly from the previous year.

It has been observed that the string filter with the dacron cloth progressively blinds during the 400 hours between acid cleanings causing the filtration rate to become less and less. When operating with the cloth in this semi-blinded condition, the pressure drop across the cloth alone may be one-third or more of the total vacuum. Therefore, the cloth filter may only have two-thirds of its vacuum available for filtration, even though the vacuum gauges of both types of filters have identical readings.

During the year from Oct. 1957 through Sept. 1958, the string discharge filter was not operated more than once every week or two because production drops due to blinding. On this basis, the Rotobelt carried the brunt of the filtering load in 1958. As noted in the 1958 Annual Report, "Production with the string discharge filter averaged about 30,000 pounds per 8 hour run, while the Rotobelt filter averaged about 40,000 pounds per 8 hour run." A review of the annual data show the filter production rate for 1958 to be only 3.05 lb/sq ft/hr, a drop from the previous year (3.24 lb/sq ft/hr) and considerably less than was obtained in the test runs in 1957 on the Rotobelt installation.

Although the filtration rates dropped from 3.33 lb/sq ft/hr in 1956 to 3.05 lb/sq ft/hr in 1958, production was up. The textile wastes alone, during this period, increased from 122 to 184 mil. gal. per year and appear to have had a noticeable affect on the filtering quality of sludges.

Figure 3 is a picture of the Rotobelt in operation, illustrating the complete discharge obtained on this filter. This is a decided advantage when filtering the elutriated-supernatant sludge, which tends to be wet and causes the strings of the string discharge filter to pull through the cake. When this happens, the cake solids remain on the cloth surface and are rubbed into the fabric structure by the strings as they are returned to the drum, thereby increasing the media blinding. This cannot happen on the Rotobelt due to the positive discharge on the small diameter roller coupled with the backwashing features that are available throughout operation, if necessary.

On the basis that the Rotobelt filter can produce four pounds of sludge cake to every three pounds produced by the string filter, there is a saving in labor and power costs by using the Rotobelt filter estimated at $53.44 per week. This is another reason why the Rotobelt filter was used for the most part in 1958. The yield on both filters, however, was below that obtained by the string filter in 1956.

### Conclusions

The overall effect on the vacuum filters by treating the large volumes of textile wastes, as illustrated by Fig. 1, has been to increase cake moisture and to decrease cake production. Only through proper digestion and elutriation techniques could the sludge be properly handled on the filters without employing extreme quantities of ferric chloride for conditioning. When the correct techniques are employed, a high solids concentration may be obtained which greatly improves the filter performance. This is shown by the results obtained in 1955 when the yearly solids concentration averaged 5.2 per cent. The cake production rate in that year rose to 4.23 lb/sq ft/hour and the ferric chloride requirements dropped to 3.78 per cent on a dry weight basis.

Improved filter operation was obtained first by use of a string discharge filter and dacron napped cloth and secondly by a stainless steel woven Rotobelt. Thus far, however, high production rates have not been obtained by either filter operating on the type of sludge existing at Cranston, R. I.

## Revision of Hydraulic Institute Standards

The Tenth Edition of the Standards of the Hydraulic Institute has now been revised, and the revised pages are available to owners of the book. These revised pages are printed on colored stock for insertion in the original loose-leaf cover. The cost is $1.25 per set, including shipping.

The inclusion of these revisions in existing copies will bring them up to date with respect to technical developments in the industrial pump field.

Some of the important changes are: Clarifications and corrections of drawings, nomenclature, and text, new definitions:—flooded suction, specific speed, and self-priming pumps, dimensions of NEMA type C face-mounted motors, shaft extension dimensions for NEMA type P vertical solid shaft AC motor, NPSH charts for centrifugal hot water pumps, single and double suction, revisions in the test code for centrifugal pumps, calculation of volumetric efficiency of reciprocating pumps, using compressibility factors for water and for hydrocarbons.

## Radioactivity in Water

The American Society for Testing Materials has published their special technical publication No. 235 entitled "Symposium on Radioactivity in Industrial Water and Industrial Waste Water."

Of interest to those in the water works profession will be the paper by C. J. Munter, Hagan Chemicals & Controls, Inc. on "Test Methods for Radioactivity Hazards in Industrial Waters" and that by Setler et al USPHS on "Analysis of Radioactivity in Surface Waters—Practical Laboratory Methods". Other papers report radioactive waste processing control, and anlysis for radionuclides in aqueous waste.

This publication is available from ASTM, 1916 Race St., Philadelphia 3 for $2.50 (members $2.00).

## Water Pollution Program

The United States Public Health Service has released a report on the water pollution control program for the fiscal years 1957 and 1958.

It covers all phases of the program —construction of sewage treatment plants, interstate enforcement activities, research and basic data analyses, and the need for increased public awareness of the water pollution problem.

The country's water pollution problem was recently described as "ominous" by Arthur S. Fleming, Secretary of Health, Education and Welfare. He added that a sustained and vigorous attack on water pollution in this country is a "must."

The document may be obtained from the Water Pollution Control Program of the PHS in Washington, or the Service's Regional Engineers.

The Conference featured . . .

# Water Systems, Resources and Saline Water Conversion

A STAFF REPORT

EDITORS NOTE: THE 79th ANNUAL CONFERENCE of the American Water Works Association was opened at San Francisco on Monday morning, July 13th, by Past President, Fred Merryfield.

After the welcome to San Francisco by Mayor George Christopher, Lewis Finch discussed the present needs of the water utility field and the plans and programs of AWWA to satisfy them.

THE ROLE OF THE BUSINESS AND DEFENSE SERVICES ADMINISTRATION, by H. B. McCoy, Administrator, BDSA, U.S. Department of Commerce, Washington, D. C.

The formation of the BDSA, Water & Sewage Division was discussed along with the development of the cooperation of various agencies in the department of Commerce with business and industry. A general resume of BDSA's two-way relationships with business and industry was given. The purpose and functions of WOC program and the National Defense Executive Reserve program were discussed. Mr. McCoy stated that in case of a "limited war" emergency, similar to the Korean action were to occur, the water works industry would again be operating under an allocation plan under the BDSA.

He then presented a brief resume of completed projects, publications and studies that are currently underway.

JAYCEE COMMUNITY RELATIONS PROJECT, by John Taylor, Vice-President, U. S. Junior Chamber of Commerce, Springfield, Ill.

The American Water Works Assn. has encouraged the adoption of the subject of water supply as a Jaycee local chapter community development project for the year 1959-60. It will provide an excellent opportunity for Jaycees to perform a valuable public service in helping obtain recognition of the important contribution an adequate water supply can make to a community. A manual has been prepared to provide Jaycees with suggestions on how to develop a local project to study water supply and translate its needs to all the citizens of the community.

DEVELOPMENT OF THE UPPER COLORADO RIVER, by Ernest O. Larson, Regional Director, Bureau of Reclamation, U.S. Department of the Interior, Salt Lake City, Utah.

The Colorado River Storage Project Act on April 11, 1956 launched a program which will make needed water development projects a reality.

Included in the progam are four large reservoir units to provide the holdover storage needed to regulate erratic flows and eleven other projects primarily for irrigation.

The schedule calls for an expenditure of $1,055,000,000 over a period of 30 years. The project will be financed initially by the federal government but about 99 percent of the cost will be repaid by people who use the water and power, and two-thirds will be repaid to the federal government with interest.

Construction on Glen Canyon Dam, the largest single project in the program, was officially begun on Oct. 15, 1956. The world's highest steel arch bridge was completed Feb. 20, 1959; it spans 1,300 ft. across the Colorado River, eliminating a 200-mile detour. Construction is underway on two other storage units and on two of the eleven participating projects.

It is contemplated that enough revenue will be realized from the sale of hydro-electric power from the Glen Canyon Dam to pay for the cost of irrigation water.

THE PHILOSOPHY OF A MODEL WATER LAW by Arthur M. Piper, Division Hydrologist, Pacific Coast Area, Water Resources Division, U. S. Geological Survey, Menlo Park, Calif.

Statutory law and common law both seek to define the acceptable extent of personal privilege and the limitations of privilege required in an orderly society. In the water supply field they seek to define privilege and limitations in use according to man's experience in various water environments. Inevitably both statutory and common law involve compromise and lag behind experience. Under the principle of legal precedent, however, the privileges and limitations they seek to define become absolute and timeless.

The physical laws of occurrence water are nature's limitations and as such are absolute and timeless. Man's knowledge of those natural limitations, however, is incomplete; only recently has it begun to approach what is needed to resolve current water supply troubles. This knowledge has come after the inherent, and in some instances contradictory, rigidities of common and statutory water law.

Each of the doctrines of water law —riparian, reasonable use, correlative rights, prior appropriation, and police power license—has been suited to the economic and hydrologic environment from which it evolved. With the possible exception of police power license, however, each has inherent rigidities that can become fal-

lacious as the environment changes. Each can fail when there no longer is space enough to run from an area of complex water problems to an area of simpler problems or, hopefully, no problems.

The basic challenges to be met by a model water statute are that it afford flexibility so that the nation as a whole may effectively manage its water destiny (with reasonable but adequate checks and balances) and that it permit groups of water users all reasonable freedom to act concertedly, each group conceding some part of its individual rights to the common advantage. These challenges can be faced under selected aspects of the appropriation, the police power, and the improvement district doctrines, but it is doubted that a single water statute encompassing all the diverse water environments of the United States would be practicable.

WATER WELL STIMULATION, A SURVEY OF CURRENT PRACTICES, by Louis Koenig, Research Consultant, San Antonio, Texas.

The increased practice of stimulating oil wells for greater productivity, prompted this study as applications and uses are quite similar. Statistical analysis of data from 900 cases of water well stimulation representing conditions all over the United States were made. In water well stimulation are included all methods for removing underground resistances to flow—specifically: surging; surging with various chemicals, including acid; pressure acidizing; hydraulic fracturing; explosives; and vibratory explosives.

The analyses were made on two different bases, technical performance and economic performance. There were five different factors considered: (1). Original specific capacity of the well. (2). Specific capacity before treatment. (3). Specific capacity after treatment. (4). The cost of the original well, and (5). The cost of treatment.

The cost of treatment varies from $100 to $3000, with an average cost of $1050 per well.

The analyses showed that although some failures were encountered, the bulk of the treatments were excellent. The technique of water well stimulation could be more widely applied with the following benefits: lowered capital costs for incremental capacity, lowered pumping costs for equal capacity, and opening areas of the country for ground water utilization where the high ratio of investment to production prohibits economic water development at present.

PRINCIPLES OF COAGULATION by Prof. A. P. Black, University of Florida, Gainesville, Fla.

The basic mechanism of coagulation must be discussed on the foundation of colloidal chemistry. In this the surface effects are critical and determine colloidal properties. Some of the factors effecting coagulation can be divided into two groups: the factors of stability and those of instability. The instability factors are Browwanian Movement and the Van de Wall forces while the stabilizing factors are hydration and zeta potential. Studies of the part played by zeta potential have developed that this potential can be reduced by increasing the ion concentration in the solution. Coagulation has been found to be most effective slightly before the point when the zeta potential is reduced to zero. Since this reduction of zeta potential can be brought about more effectively by use of trivalent ions the empherical procedure calling for the use of this type of ion is now supported by theory.

Also included in this study is work on older coagulant aides such as the gum, long chain acids, starch, etc. Most of these aides are polymers. It has been found that in the uncharged form the polymer molecule is coiled around on itself. As it is charged the molecule tend to straighten out. This long charged molecule is probably the form in which the material is when it enters into coagulation.

CONVERSION OF SALINE WATER by Everett D. Howe, Professor of Mechanical Engineering, University of California, Berkeley, Calif.

Multieffect and vapor compression distillation still account for over 90 percent of the installed demineralizing capacity of saline water conversion equipment. New developments in this equipment include the multiflash devices with 30-40 stages of flash, the wiper condenser-evaporator, and the centrifugal condenser-evaporator. Nuclear heat sources are being seriously considered to alleviate the otherwise heavy demand on fossil fuel resources although costs are high even with this source of energy.

Solar distillation has found application in household size units in Algeria, Australia and Kenya. The large U.S. Department of the Interior installation in Florida should produce data on village size applications.

Electrodialysis has entered the pilot plant stage with units of 25,000-gpd capacity in continuous production and one plant containing several units of more than 500,000-gpd capacity under construction. Recent developments in membranes and in pile or stack design have promise for sea water applications.

Freezing is receiving some attention as a method of separation and has advances to the pilot plant stage in at least one instance. Other methods, such as reversed osmosis and solvent extraction, have not yet progressed to the pilot plant stage.

The program of the Department of the Interior for constructing five demonstration plants has progressed to the stage of the selecton of processes to be used in the first two plants.

CROSS-CONNECTION CONTROL—PANEL DISCUSSION
by E. Jerry Allen, Assistant Superintendent Water Department, Seattle, Wash.

Operators of public water supply systems have a legal and moral obligation to provide their customers with a safe, palatable water. Protection of water quality between the treatment plant and the consumer is fraught with hazards. Federal, state, and local laws have been enacted to eliminate such hazards, and the water utility operator is obligated to diligently prosecute a positive program to eliminate any health hazard. One of the greatest hazards is a cross connection.

The basic principle of safety in a distribution system is that there be no physical connection between a public water supply main and any other water pipe or fixture that may contain material that could be detrimental to the public water supply.

The joint committee of AWWA and state sanitary engineers on backflow preventers recognizes that the air gap principle is basic in affording maximum protection against backflow. An adequate air gap must exist, and frequent official inspection and regulation are necessary. Such inspec-

tion is also necessary for any mechanical backflow preventer.

Final responsibility for the quality of water delivered to the consumer must rest with the officials of the water supply system. In some states the responsibility is defined by law. In others, the use of mechanical backflow preventers is specifically prohibited. Wherever a cross connection or backflow condition may exist, the problem should be carefully appraised, and no precaution should be ignored where there is even the slightest chance that the quality of the water supply may be impaired.

Andrew Dempster, Dir. Bu. of San. Eng., Dept. of Health, Detroit, Mich.

The degree of which measures have been taken to eliminate cross connections has been mainly dependent on the number of reports of waterborne disease resulting from their existence. The absence of current mention of the problem in the press or in technical journals might suggest that the cross connection menace has been removed. Unfortunately, it has not. There are more possibilities of cross-connection hazards today than ever before because of the use of potable supply in more complex industrial processes and equipment.

Many states have attempted to solve the problem by legislation, making it illegal to maintain a cross connection between safe and unsafe supplies. Other states supervise and protect existing cross connections, but have made it unlawful to create new ones. There is some doubt the protection afforded by mere law when an emergency arises and water must be supplied from one system to another.

Almost every enforcement officer has had the experience of finding cross connections that may have been operative at one time. If an incident ever reached the proportions of a disaster, the existence of a hazard has probably never been reported publicly because of the reluctance of responsible authorities to admit any human failure.

During World War II many protective devices were installed at water outlets on seacoast piers after operative cross connections discovered on ships were found to be causing contamination of onshore systems and systems in other ships using the same facilities.

As the reduced-pressure type of backflow preventer has been available for 15 years, there has been time to evaluate its performance. A joint committee of AWWA and the Conference of State Sanitary Engineers was formed in 1953 to study the devices. Their report in 1958 outlined the function of various types. The report stated that the devices have been reliable in field service and recommended that they be approved for installation on service connections at other points acceptable to local authorities. It was also recommended that inspection programs be continued or instituted where necessary, and that testing procedures and installation standards be continuously improved by the establishment of a standing committee for cross-connection control.

Notwithstanding the apparent progress in their elimination, a danger to the public health still lurks wherever there are the ingredients for the creation of new cross connection.

Henry J. Ongerth, State Department of Health Berkeley, Calif.

Description of the reduced-pressure backflow preventer is not yet complete. No details are given concerning the diaphragm and the spring-loaded poppet valves, nor are the objectional feature of "spitting"or the possibility of capping the relief outlet adequately described.

The major advantages of the reduced-pressure principle device are that it has fail-safe features, and there is no external evidence of failure if the device is installed and used as intended by the manufacturer. The fail-safe features depend on reliable maintenance and may be readily destroyed by misuse of the device, however.

The applicability of the reduced-pressure principle device and other devices such as double check valve assemblies and air-gap devices, is subject to question. The feeling seems to be that the reduced-pressure principle device is a more acceptable device for high-order hazards than is air gap separation, and that a reduced-pressure principle device must be used in all instances where a public health hazard of any degree exists.

WATER—AMERICA'S NO. 1 PROBLEM, by Fred A. Seaton, Secretary of the Interior, Washington, D. C. Due to illness, Secretary Seaton's address was read by Allen Cywin, Office of Saline Water, Dept. of Interior.

Presently, the United States uses about 240 billion gallons of water a day. If population and water-use trends continue, in 20 years that consumptive figure will be between 500 and 600 billion gallons per day—provided we have it available.

New supplies of natural fresh water will surely become more expensive in the years ahead and the supply available will more and more tend to be less than needed. Our hope is that just as surely the cost of converting saline water to fresh will come down. In one community after another these cost curves will one day likely cross, and then converted sea or brackish ground water will be the less expensive of the two. In some localities it will be the only reliable source.

The first of the Department of the Interior's sea water conversion plants, using the long tube-vertical multiple effect distillation process to produce one million gallons of fresh water per day, will be located at Freeport, Texas.

The Freeport site was selected because it offers several features not available at other locations considered. The conversion plant is to be located two miles from the coast adjacent to an existing Dow Chemical Company plant. A sea water intake line serving the chemical plant will provide the conversion plant with feed water. Dow Chemical will sell us steam, thus eliminating the necessity of constructing a boiler.

The city and the chemical plant will purchase all the product water of the plant. Dow Chemical will also utilize the brine effluent and conduct research on the economic potential of brine utilization.

Seven California cities have been selected for further consideration, out of 18 locations proposed, for the West Coast conversion installation. The sites are San Diego, Lompoc, Ventura County, Orange County, San Clemente, Monterey County, and Camp Pendleton.

This second installation will employ the multi-stage flash distillation method, with an atomic reactor as the heat source.

The third conversion process, electrodialysis, will be demonstrated in a plant to be located in the Northern Great Plains or arid Southwest area.

NEW JERSEY'S FORWARD STEP IN WATER SUPPLY, by William J. Orchard, Maplewood, N. J.

New Jersey has recently culminated a successful $45,850,000 bond issue for a water improvement program.

The state learned how, the hard way, to successfully manage a program. This was shown by the mishandling of an ill-fated referendum for water supply improvements in 1955. To be successful a program must: (1) be well engineered, legally sound, and financially well planned; (2) each member of the legislature must be accurately informed of the program objectives and urgency; (3) the general public must be accurately and skillfully informed; and (4) the program must be sparked by dynamic leadership and based on sound business principles.

A feature of the successful second New Jersey program was the enlistment of support of private industrialists, and the development of a sympathetic spirit in the local press. No state funds were used in the extensive campaign to inform voters of the facts. One labor union and 60 corporations contributed a total of $62,000 to the publicity campaign.

TASK GROUP REPORTS MEMBRANE FILTER by Jack E. McKee, Professor of Sanitary Engineering, California Institute of Technology

Since its reactivation in 1958 this group has engaged in keeping up to date data on the membrane filter and reporting periodically in JAWWA. In addition abstracts have been prepared of all the articles appearing in the literature on the equipment. Since several other organizations are doing the same work the group has shifted their emphasis to a study of media for membrane filter use and have limited their abstracting to this phase. Recently McCarthy and Dalaney at the Lawerence Experiment Station have obtained a grant for an exhaustive study of this problem. Because of this study there is little point in the group publishing a report which would be made obsolete by the McCarthy Delaney report.

The committee has observed the following

1. That utilization of the latest MF methods develops MF counts less than by MPN methods.

2. Differences are dependent apparently on the quality of the water i.e. where *Esch. Coli* predominate goof MPN MF agreement is obtained while with a dominant *Aer. aerogenes* good agreement is not found.

3. The most significant possibility of major progress in developing the usefulness of the MF method may lay with deviating from the conventional approach. Should we not perhaps stop trying to make MF agree with MPN and consider reevaluating our whole approach including if necessary reconsideration of coliforms as a standard.

TASK GROUP REPORT DIATOMITE FILTERS by E. Robert Baumann, Professor, Iowa State College, Ames, Iowa

This group has studied the design, operation and maintenance of diatomite filters. With the increased use being made of this equipment in mind the group has prepared a set recommendation which at present is being reviewed and revised by the committee. Among the items considered were the increase in availability of design data, the fact that the success of each installation is more or less dependent on factors individual to it and the relative merits of vacuum vs pressure filtration. Pilot plant studies being carried by Professor Baumann have developed among other things that removal of dissolved iron is not as effective with vacuum filtration as with the pressure approach and that head loss with both methods is essentially the same. Further study with these pilot units will be on specific items needed to develop design criteria.

TASK GROUP REPORT RADIOACTIVE COMBINATION by Harold E. Pearson, Research Chemist, Metropolitan Water District of Southern California, La Verne, Calif.

This group has as its project the study of instrumentation and testing for radioactive contamination of water. A report on equipment for testing gross alpha and gross beta measurements has been submitted previously. Cooperation among the Taft Center, the APHA, the FSIWA and the AWWA have resulted in the establishment of a gross beta method and instrumentation which will be included in the next issue of Standard Methods. This same group has also been working on the development of a method from measurement of $Sr^{90}$. This task group will continue its work with particular emphasis on continuous measuring devices and on development of simple determination for specific radioactive contaminates.

TASK GROUP REPORT SYNTHETIC DETERGENTS by Paul D. Haney, Black & Veatch, Kansas City, Mo.

The primary effect of ABS seems to be connected with foaming and it apparently has no effect on coagulation. The phosphate builder appears to create coagulation problems. These problems arise out of the failure of ordinary sewage bacteria to metabolise ABS. The solution of course would be to use a surface active agent which would be attacked by bacteria but unfortunately no material is available that compares costwise with ABS. Syndet manufacturers are working on this problem and the British report that they have developed an ABS which can be metabolished.

Last year this task group reported an infra-red and a methylene blue method of syndet determination which will be listed as a tentative method in the new edition of Standard Methods. The group is now following a project on new methods for detergent determination.

TOXICITY STUDIES OF SMALL QUANTITIES OF CADMIUM AND HEXAVALENT CHROMIUM by R. U. Byerrum, Chemist, Kedzie Chemical Laboratory, Michigan State University, East Lansing, Mich.

In previous studies cadmium and hexavalent chromium were administered to rats for a year in drinking water at concentrations of 0.1-11 mg/l. After the feeding of cadmium or hexavalent chromium, no differences between the experimental animals and controls, which received no added cadmium or chromium, were noted in water intake, food intake, or body weight; nor were any pathological changes in blood or other tissues observed. In animals receiving cadmium for a year, however, the concentration of the element in liver and kidney increased in direct proportion to the cadmium intake. Tis-

sue concentrations of cadmium at the end of a year's ingestion were roughly twice those obtained at the end of 6 months, except at the lowest levels of intake (0.1-0.5 mg/l cadmium). Hexavalent chromium administered for a year at concentrations less than 5 mg/l resulted in no accumulation of the element in kidney, liver, or femur. At concentrations above 5 mg/l, however, accumulation in liver, kidney, and spleen occurred in direct proportion to the quantity of chromate fed. Although these data give some information concerning accumulation of cadmium and chromium in the rat over 1 year, determination of a standard for these elements in drinking water is not possible until further information is obtained. Several groups of dogs were therefore administered concentrations of cadmium and chromium of 0.1-10 mg/l in drinking water for 4 years. There were no differences in food or water consumption, growth rate, organ weights, blood hemoglobin levels, or white and red blood cell counts between any of the experimental animals and the controls. Investigations of tissue levels of cadmium and chromium and microscopic examination of tissues for pathological changes are in progress.

RECALCINING WATER SOFTENING SLUDGE—PANEL DISCUSSION by William B. Crow, Black & Assoc., Gainesville, Fla.

Water softening sludge concentrated to about 60 percent solids can be burned at 2000°F to lime. About 85 percent recovery can be expected and the carbon dioxide generated can also be recovered and used. The magnesium content of the sludges has been a problem which has now been brought under control but which slowed the application of recalcining to this type of sludge. The economic factors which enter into determining the applicability of this process are tonnage of lime used, cost of lime and freight, the possibilities for sludge disposal, the value of carbon dioxide together with fuel and power costs. It appears that 6 ton/day of lime may be the low break point if sludge disposal is a problem.

Three methods are available for recalcining namely—rotary kilns, flash calciners and flow solids calciners.

Claud R. Erickson, Mech. Eng. Board of Water & Light, Lansing, Mich.

The city operates a Fluosolids calcinator to treat a sludge with is 88 percent calcium carbonate, 8 percent magnesium hydroxide and 4 percent inert. Some 10 million BTU per ton is required to produce a 93 percent available lime at an overall cost of $18.50 per ton. This plant was developed as a solution to the sludge disposal problem. After a significant period of operation the plant has just about broke even and it is felt that it has just solved the sludge disposal problem.

William T. Effert, Director, Dept. of Water, Dayton, Ohio

Recalcination entered the picture at Dayton when the sludge disposal problem began to take on critical proportions and an economic study showed that a recalcining plant would pay for itself in seven to ten years. The sludge is burned in a kiln after being carbonated to remove the magnesium. This is done in a shallow tank into which flue gas is injected through perforated pipe. This plant also recovers $CO_2$ from the kiln for use in recarbonation. At present production is about 1.2 times the amount of lime used and sales amount to 40 to 60 tons per day.

Two interesting problems presented themselves. The first resulted from the fact that more frequent maintenance is required on this part of the plant than on the rest of the water works which required some reorientation of thinking in this regard. The second problem evolved out of the fact that the city charters of Dayton and the other nearby cities, which would be the potential consumers of the excess lime, required that they accept bids for supplies in the former case and that Dayton accept bids for surplus materials. When this impass resulted in no bids for the lime Dayton was then able to get a ruling by the city attorney that they could submit bids, etc. to try to sell it. The first year of operation produced 22,000 tons and 1958 yielded $153,000 net profit.

C. F. Wertz, Director, Dept of Water & Sewers, Miami, Fla.

After a rather lengthy study Miami began construction on its recalcining plant in late 1947 and completed the plant in December 1948 at a final cost of $792,521. Sludge from the clarifiers is thickened and dewatered with a centrifuge. Sludge enters the kiln at a consistancy of about 66 percent solids, is burned at 2100°F, cooled, and then transferred to storage. Carbon dioxide is recovered for use in recarbonation. As can be seen from table 1 the lime recalcination operation at Miami has been a success and should be an incentive to other water utilities, with sludge problems, to consider this process.

## LIME RECOVERY PLANT
### Miami, Florida
#### Table I
#### PRODUCTION COSTS vs. PURCHASE COSTS
#### Year Ended June 30,

| | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 | 1957 | 1958 |
|---|---|---|---|---|---|---|---|---|
| Assumed annual purchase costs for lime | $299,060 | $326,100 | $343,140 | $340,740 | $395,136 | $453,244 | $485,870 | $487,598 |
| Actual net lime plant expenses, excluding interest and depreciation | 97,055 | 112,182 | 107,051 | 120,897 | 117,405 | 146,981 | 187,540 | 182,470 |
| Indicated gross savings | 202,005 | 213,918 | 236,089 | 219,843 | 277,731 | 306,263 | 298,330 | 305,128 |
| Estimated interest and depreciation expense | 28,900 | 30,254 | 30,950 | 32,750 | 34,150 | 34,000 | 35,800 | 36,800 |
| Indicated Profit return on Investment | $173,105 | $183,664 | $205,139 | $187,093 | $243,581 | $272,263 | $262,530 | $268,328 |
| Investment in Lime Plant, as of June 30 | $798,778 | $817,672 | $818,654 | $818,833 | $847,069 | $852,316 | $852,316 | $856,497 |

Construction Supervision Part III.

# Pipe Laying and Jointing

by LEO J. RITTER, Jr.
Construction Editor

EDITORS NOTE: This is the third installment in a continuing series on construction supervision. Written from the viewpoint of the construction man, information in this series is designed to be of practical usefulness to water and sewage works personnel who have responsibility for construction and major repair work.

This installment—and the next—cover laying and jointing of all types of pipe used for water and sewage. Preceding installments dealt with receiving, inspection and handling of pipe; trench preparation; and pipe bedding.

Previously, information has been given on the handling of pipe up to the side of the trench. Bed of the trench has been prepared to receive the pipe. This installment picks up from that point.

## Handling The Pipe Into The Trench

■ DETAILED PROCEDURES for handling the pipe and lowering it into the trench obviously vary with the type size and weight of the pipe sections being installed. Pipe is generally strung out in a line along one side of the trench, ready for laying. The following factors are important.

1. Pipe is frequently laid from the lowest point on the line upstream.

2. Bell-and-spigot pipe is laid with the bell end pointing in the direction of laying.

3. With certain types of pipes and certain types of joints, a portion of the joint is assembled on the pipe before the pipe is lowered into the trench. For example, installing a mechanical joint on a cast iron or steel pipe line, the gasket and gland are placed on the spigot end of the pipe before the pipe is lowered into the trench.

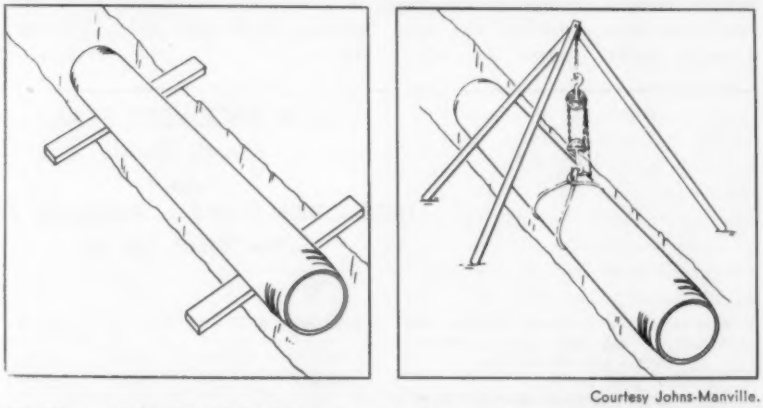
4. Before or as the pipe is being lowered into the trench, each section often receives another inspection. For example, cast iron pipe may be rung with a light hammer while suspended above the grade in order to detect possible defects. All types of pipe may be subjected to visual inspection.

5. Every effort must be made to keep water pipe line sections as clean as possible during laying.

6. Appropriate precautions must be taken to handle pipe sections care-

Courtesy Price Brothers Company.

**HANDLING A SECTION of a concrete pipe with a sling and backhoe. Note double hook for sling.**



Courtesy Johns-Manville.

**FIGURE 1. LOWERING PIPE with mechanical equipment. Left, skids placed across trench and pipe rolled to approximate position. Right, tripod placed, pipe lifted and skids removed, ready to lower pipe.**

fully, with complete control, so as to avoid damage. Under no circumstances should pipe sections or jointing materials for watermains be dropped or dumped into the trench.

7. Handling large sections of pipe is a dangerous business; all appropriate safety precautions should be observed.

### Lowering Pipe By Hand

Light sections of pipe may be lowered into the trench by hand, using one man at each end of the pipe. One man can repeatedly lift about 75 pounds, so this method should be used only for sections weighing up to about 150 pounds. The method is suitable only for straight-walled trenches with firm edges that will not give away under the weight of men and pipe. Limiting depth of trench for this method is about 5 feet, the height to which the men in the trench can reach and handle the pipe easily.

### Lowering Pipe With Ropes

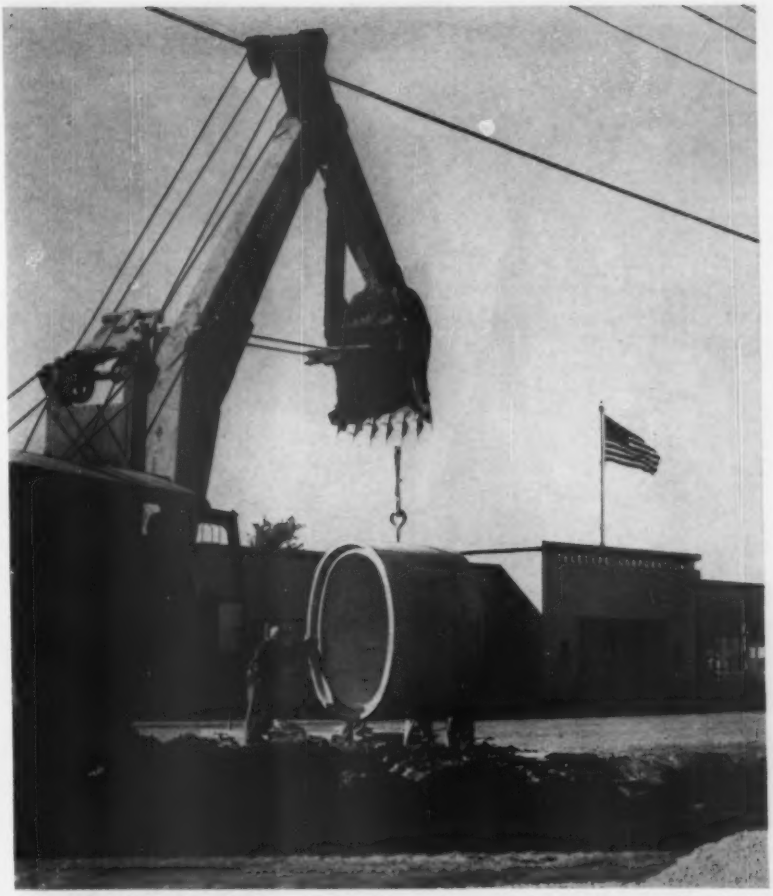
Heavier pipe sections—up to perhaps 800 pounds per length—can be handled from the side of the trench by the use of ropes. In this process, one rope is passed around each end of the pipe, with the axis of the pipe parallel to the centerline of the ditch. Either one turn or two is taken around the pipe with each rope.

The rope ends on the bank are anchored by standing on the free end —in which case a safety knot is tied in the rope so that the free end will not slip beneath the feet of the pipe handlers—or to stakes. Working in unison, the ropes are paid out and the pipe lowered slowly into the trench. The pipe section should be under complete control and every effort made to avoid striking the pipe against rocks or boulders which may be embedded in the trench walls, sheeting, or other hard, unyielding objects.

As the pipe is lowered, it generally can be shifted enough to place it in the proper position with regard to sections laid previously. Ropes can be left in place until the pipe is properly lined up and butted, so that the pipe handling crew can help in jockeying the section into final position.

### Lowering With Mechanical Equipment

Larger pipe sections are invariably handled with mechanical equip-



**GOOD CONSTRUCTION** practices are shown in this photograph of the laying of a concrete pipe line.

Courtesy Lock Joint Pipe Co.

**INSTALLATION OF RUBBER** gasket on concrete pipe.

Courtesy Clay Products Association.

JOINTING OF CLAY PIPE with factory-installed flexible compression joint.

Courtesy Hamilton Kent Mfg. Co.

RUBBER GASKET (Tylox joint) in place on concrete pipe.

ment, with three basis approaches being used. They are

1. Use of tripod and chain-falls, block and tackle, or windlass. One procedure of this kind is shown in figure 1. This method is sometimes used in combination with others.

2. Use of crawler tractor with sideboom pipe laying attachment. Where high production is desired and the machine is available, this method may be very profitable. It is more often used on gas, oil and other pipelines than on water and sewage works.

3. The most common method is by the use of a wire rope sling and the excavator (backhoe) which is being used to dig the trench. It offers the obvious advantage of using a piece of equipment which is on the job anyway. The accompanying photographs show two methods of handling pipe; one case in which a lifting eye is used and the other where a wire rope sling has been placed at the balance point of the pipe section. Note the use of the double hook in this application.

In handling and laying cast iron and steel pipe sections, as well as in preparing the bed of the trench for their installation, advantage may be taken of their high beam strength to somewhat simplify procedures discribed in this and the preceding installment.

## Jointing

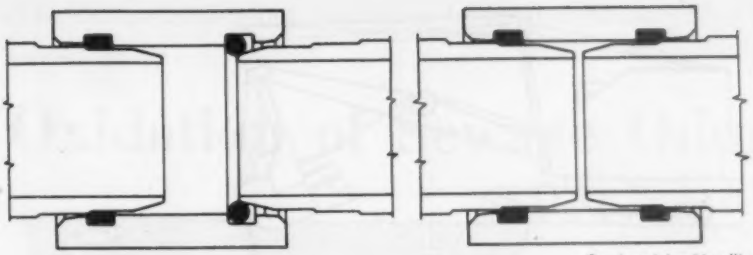
Any one in the water and sewage works field is aware of the fact that there are a large number of ways in which two pieces of pipe can be joined together. Different types of joints are used with pipes of different materials and to meet various conditions. Basic joint types are often available from a number of different suppliers, and under different brand names.

In order to simplify this portion of the discussion as much as possible, joints have been classified into five major groups, on the basis of materials used and method of application. These groups are

1. *Rubber Joints,* factory and field-installed joints and couplings in which a rubber gasket (or gaskets) is used.

2. *Mechanical Joints,* as used principally with cast iron pipe.

3. *Couplings,* such as used for steel



Courtesy Johns-Manville.

**FIG 2 RING-TITE JOINT for asbestos cement pipe. Left, pipe end inserted into previously assembled bell coupling. Right, pipe ends in final position in joint assembly.**

and cast iron, and the much simpler ones for plastic pipe.

4. *Poured Joints,* including those for cast iron, clay and concrete pipe.

5. *Welded Joints,* as used in steel pipe lines.

In this installment, only rubber joints will be covered, with the other types being discussed in the next issue.

Across the board, joints of this general classification are used more widely than any other, for water and sewage installations. Joints of this general type are used with concrete, cast iron, clay, asbestos cement, and steel pipe.

Approximately three-quarters of the cast iron pipe now being sold in this country uses this type of joint.

### Concrete Pipe

Rubber joints are widely used in jointing concrete pipe, because of their basic simplicity of installation. Joint exteriors are frequently sealed with mortar, even though a rubber gasket is used.

Commercial organizations offer several varieties of joint, all of which incorporate a rubber gasket of some type. In some cases, the gasket is a simple "O" ring; more elaborate rings are also used. These joints are field applied; the gasket is lubricated if specified by the manufacturer and slipped over the "spigot" end of the pipe. Bell end of the adjoining pipe section is then shoved home, compressing the rubber gasket into the annular space between the bell and spigot. Ring gaskets of this general type are used in plain, reinforced, and pretensioned concrete pipe. On the pretensioned pipe produced by American Pipe and Construction Company, the "O" ring slips over the spigot end of the steel cylinder which forms the backbone of each pipe section.

The "steel and rubber" joint, such as those produced by the Lock Joint Pipe Co. and Price Brothers Co., incorporates a rubber ring gasket. In these pipes, both the bell and spigot ends are protected by machined steel rings which are integral parts of the pipe; the rubber gasket is compressed into a groove and is completely surrounded by steel.

### Cast Iron Pipe

Basic rubber joint for cast iron uses a simple rubber gasket. The bell end of each cast iron pipe section has a groove of the proper dimensions to receive the gasket. To install, the inside of the bell is first wiped clean. The rubber gasket is then flexed and inserted in the groove, this step may be taken in advance of installation. A thin film of special lubricant is applied to the gasket. The spigot end is wiped clean and the two ends of the pipe mated in the trench.

With this type of joint, bell holes normally are *not* required when the pipe is layed in a flat bottom clay or mud trench. This type of joint can be layed in a wet trench, or even in a trench that is filled with water.

### Clay Pipe

Often used with clay pipe are what are termed "flexible compression joints", in which the resilient material may be rubber. These joints are normally applied at the factory by a special manufacturing process and are thus ready for immediate field installation. Resilient material is bonded to the outside of the spigot and to the inside of the bell; materials of the same or differing resiliencies may be used. Installation involves the steps of wiping, lubricating, and mating the pipe ends. On occasion, a gasket ring similar to those previously described may be used.

### Asbestos-Cement

Asbestos-cement pipe sections are usually joined by couplings; each coupling incorporates two rubber ring gaskets. Action of this type of union is shown in figure 2. The coupling is usually applied to one end of each pipe section before the pipe is lowered into the trench; it is said the pipe section has been "belled" when this is done. Pipe sections are coupled in the trench, in about the same way as described previously. Pipe ends and rubber rings are cleaned and lubricated before assembly begins.

### Steel Pipe

On occasion, steel pipe is jointed by the use of an "O" ring rubber gasket, in a fashion similar to that which has been described for other types of pipe. An advantage of the method is that it provides a fast-laying, simply installed field joint which permits liberal deflection to accommodate curves and to facilitate installation in rough country.

## Rubber Joint Assembly Methods

Specific instructions for installing each type are supplied by the manufacturer involved. They should be followed scrupulously for best results. Preliminary steps involve cleaning and lubrication of the pipe and joint surfaces, and positioning of the gasket.

General procedures for actually mating the two sections of pipe in the trench include the following.

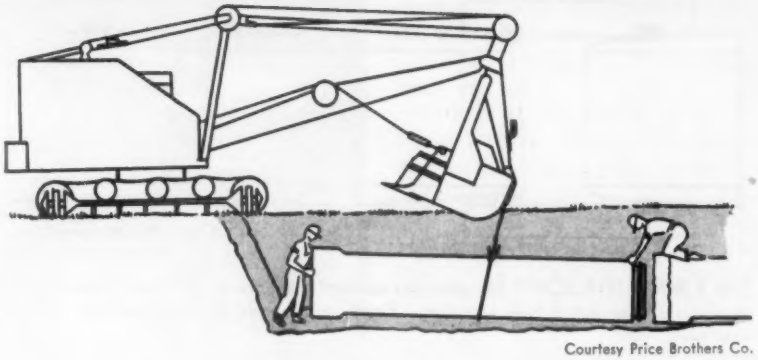
*Crowbar.* For smaller pipe sizes, the spigot end may be simply be shoved home by hand or by the use of a simple lever, such as a crowbar. The crowbar may be pushed directly against the bell end or against a block of wood held against the bell.

*Fork-Tool.* Again, for smaller sizes of pipe, a special fork-tool may be used,

as shown in the accompanying photograph. The fork is placed in back of the bell, and the choker sling is wrapped around the spigot end of the entering pipe. Ends of the wire rope sling are secured and the spigot end moved into position by pulling on the handle of the fork tool.

*Ratchet Jack* Somewhat larger sizes of pipe can be handled by ratchet jacks or other devices of the same general classification. As shown in the accompanying illustration, the jack is placed on the top of the pipe. Front and rear sections of the jack are connected by wire rope slings to the spigot and bell ends of the adjacent pipe sections. The spigot end is then socketed by operation of the jack.

*Backhoe* Heavy pipe sections—for example, large diameter concrete pipe—are customarily and conveniently handled by a backhoe and attaching wire rope sling. Basic setup for handling the pipe in this fashion is shown in figure 3. In this procedure, the backhoe boom is lowered to a nearly horizontal position and the bucket pulled in close to the base of the machine. The operator then pushes out the bucket, forcing the plain end of the pipe into the bell. A man in the trench can guide the pipe with a crowbar or timber at the bell end. If properly aligned, no difficulty should be experienced in making the joint.



Courtesy Price Brothers Co.

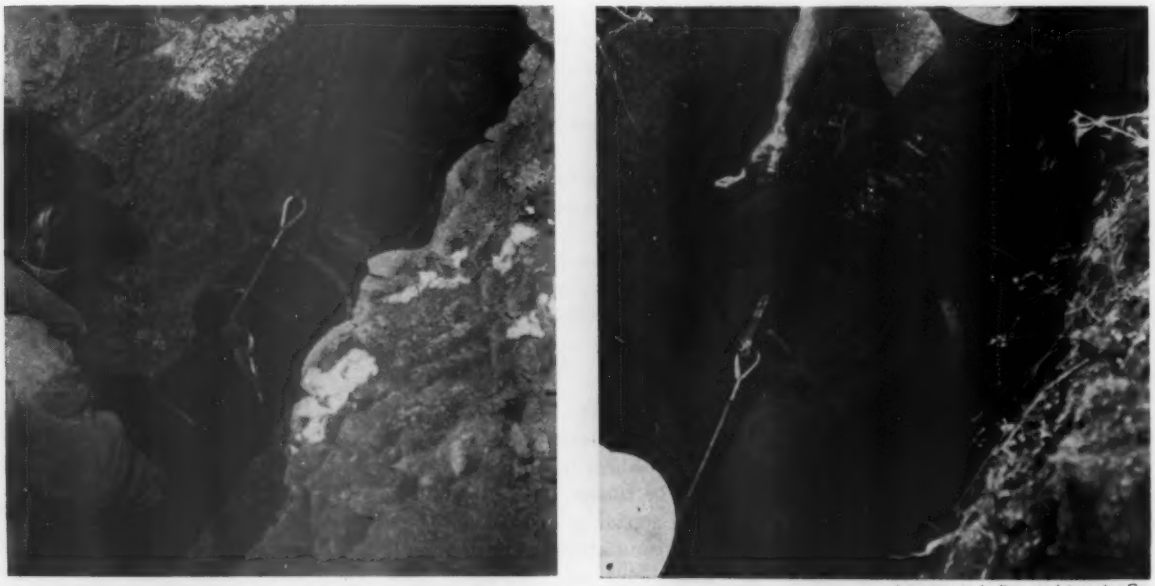
**FIG. 3 Use of backhoe in assembling large-diameter pipe.**

## Additional Considerations

Where rubber gaskets are used, it is essential that the joint be completed in such a way that the gasket is in its proper position after assembly. This basic consideration may be checked in variety of ways, depending on the type of pipe and the type of joint. For example, on at least one type of rubber joint used with cast iron pipe, the spigot end is painted with two stripes, spaced a short distance apart; the joint is satisfactorily assembled when one stripe has disappeared into the bell socket and the leading edge of the second stripe is approximately even with the bell face.

In assembling large concrete pipe sections, steel inserts are temporarily placed between the pipe faces as the joint is being closed, to prevent complete closure; while the inserts are in place, a feeler gage is used to make certain that the gasket is properly seated. Other devices and procedures are used for other materials and joints.

Steel and rubber joints used with concrete pipe are grouted on the outside and inside in order to complete the installation.



Courtesy U. S. Pipe and Foundry Co.

**Two methods of assembling cast iron pipe sections (Tyton Joints) in the trench. On the left, the use of a fork tool. On the right, use of a ratchet jack.**

A serious problem which resulted in frequent complaints from the neighbors of a pumping station was solved by . . .

# Oxidation of Sewage Odors

by A. H. ULLRICH and R. J. RUFF
Supt. Water & Sewage Treatment
City of Austin and President,
Catalytic Combustion Corp.

**EDITOR'S NOTE: The storage of sewage in a surge tank adjacent to a residential area presented an odor problem which the city of Austin solved by means of catalytic oxidation. This interesting and new approach to sewage odor control could provide a solution to some perplexing problems.**

■ To THE casual observer, the destruction of waste gases would appear to have no significant relationship to sewage treatment. Actually, it is becoming increasingly evident, in the light of today's technology, that disposal of all waste matter, whether in gaseous, liquid, or solid state, requires simultaneous considerations of the related influences to both water and air contamination.

It is generally recognized by sanitary engineers that a job of correcting a water pollution problem is not completed if, in doing so, an air pollution problem is generated. Less emphasis has been given to the equal

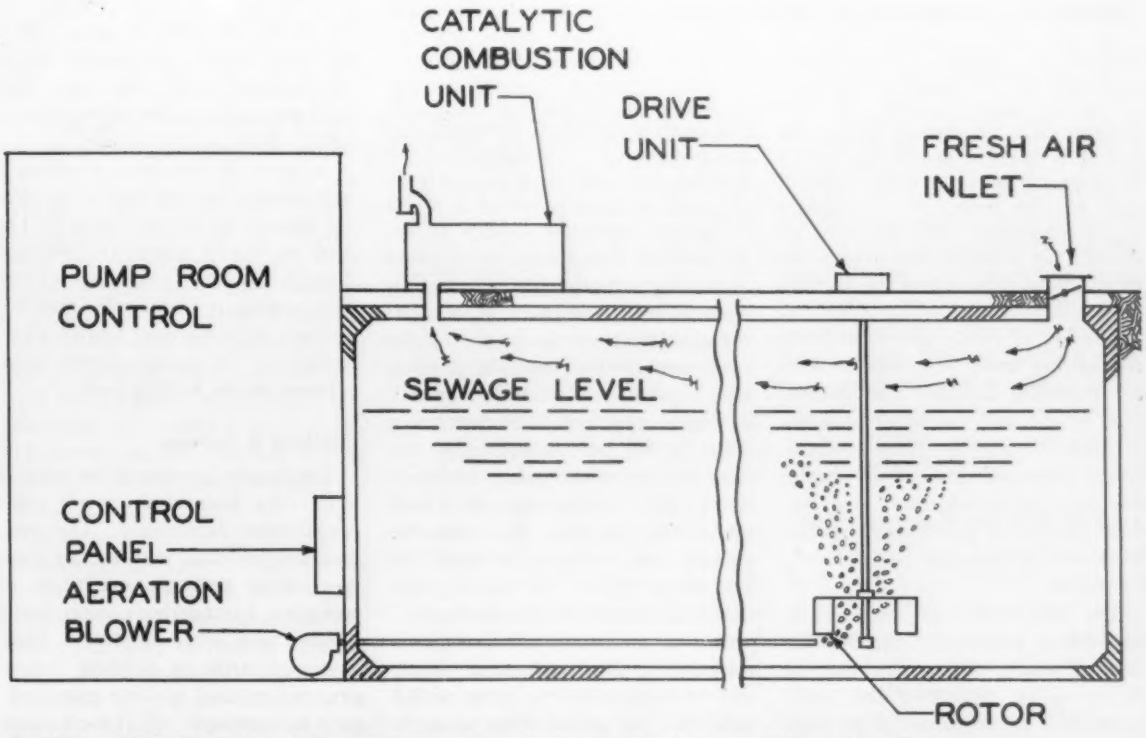



**FIGURE 1 ELEVATION view of the installation at Austin showing the location of the various elements.**

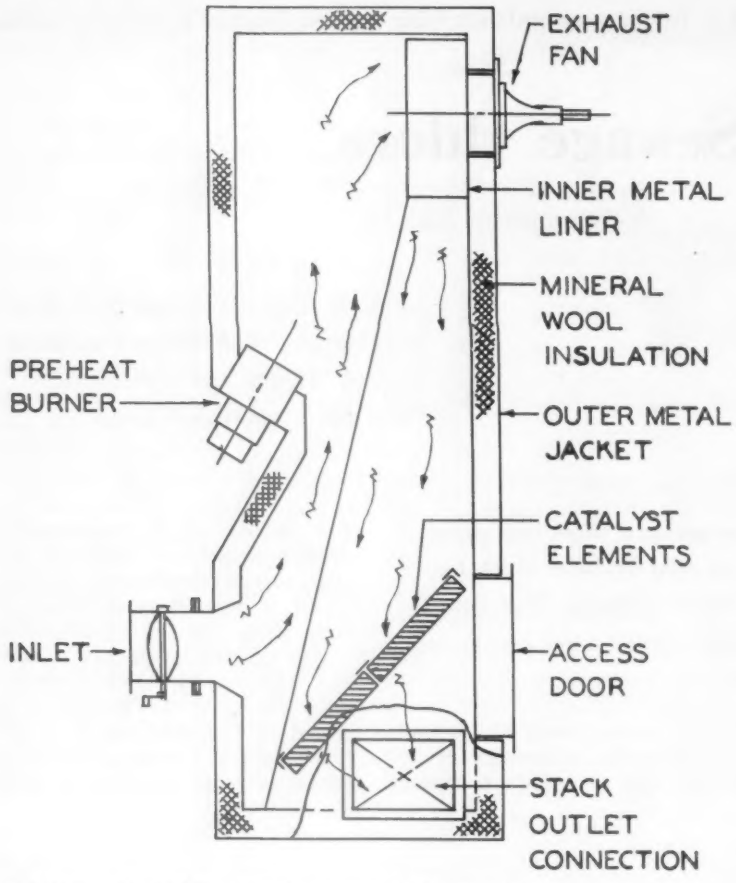



FIGURE 2 PLAN VIEW of the Austin oxidation unit.

inconsistency of correcting an air pollution problem by simultaneously producing water pollution, when it may not be necessary. It appears logical, therefore, that control of industrial air pollution necessitates the employment, where possible, of such corrective means as will prevent the imposition of costly additional loads on existing water resources or sewage treatment facilities. The installation of catalytic oxidation systems, for destruction of gas phase contaminants, developed and refined during the past ten years, now give evidence that some problems in sewage treatment systems can be effectively controlled.

The applicability of the catalytic combustion process for the destruction of sewage odors can best be illustrated by describing the application and performance of the first unit placed into operation in connection with a municipal sewerage system. At the City of Austin, Texas, a 3-million gallon covered sewage holding tank has been provided as a reservoir for untreated sewage to receive excess flow during those hours of the day when the total sewage flow exceeds both the capacity of an existing outfall line and the capacity of the treatment plant. Thus, the holding tank is partially filled, and completely emptied, once every 24 hours. In order for the tank to accomplish the dual purpose of increasing the effective 24-hour average capacity of both the outfall line and the treatment plant it was necessary to locate the installation near a lift station adjacent to a residential neighborhood.

During retention, the sewage is subjected to slow mechanical mixing and to aeration in the order of 0.1 cubic foot per gallon. This serves to maintain the solids in suspension, and the sewage in a fresh condition. However, during the hot summer season the sewage is not always in a fresh condition when received with the resultant objectionable concentrations of volatile, odorous constituents are released. The volume of gases (air and odorous constituents) which are liberated from the tank is variable, depending upon the air-blowing rate and the rate of sewage flow into or out of the tank. With maximum aeration capacity, and with both transfer pumps operating at maximum displacement capacity, the rate of gaseous release from the tank is equivalent to 1,000 CFM of water saturated, odorous air.

With a residential area adjacent to the tank location, treatment of the vented air was found necessary to avoid neighborhood complaints. The corrective measures employed are shown schematically in Figure 1. A volume of approximately 1400 CFM of odorous gases are withdrawn into the catalytic combustion system, where the odorous constituents are consumed. This capacity permits a minimum of 400 CFM to be drawn into the tank through the fresh air opening installed in the tank cover at the opposite end. In this manner a continuous drift of replacement air moves the odorous gases toward the vent outlet, continually purges the enclosure, and eliminates stagnant areas where flammable mixtures might otherwise accumulate.

A view of the fume combustion unit mounted on the roof of the holding tank is shown in Figure 2. The final oxidized gases are released through the short, stub-stack shown. The system is remotely operated through an automatic control panel located in the pump control room adjacent to the holding tank.

### Catalysts & Systems

The precise function of the catalyst in the odor destruction process justifies further explanation. The contaminants released with the air from the holding tank are a mixture of complex hydrocarbons, mercaptans amines, and other organics. Their molecular structure contains hydrogen, carbon, and in some cases, sulphur and nitrogen. All of these gases can be oxidized to produce end prod-

ucts of water vapor, carbon dioxide and free nitrogen, which of course, are all odorless and innocuous. In the oxidation of mercaptans, some $SO_2$ is also generated, but the sulphur bearing compounds are generally present in insufficient quantities to produce a detectible presence of $SO_2$ in the oxidized gases.

Since the combustible compounds are present in the exhaust air in such extremely dilute quantities, oxidation cannot occur by normal flame combustion means. However, the catalyst, simply by its presence accelerates the oxidation reaction, and permits the combustible constituents to be consumed when the odor-laden air is heated to temperatures of 500 deg. to 600 deg. F.

The catalyst is similar in appearance to a metallic air filter mat. It consists of a high nickel alloy, crimped ribbon material, packed between similar high nickel container screens, and surrounded by an alloy channel frame. Platinum alloy metals are electrolytically deposited on the nickel alloy "catalyst support" and conditioned for catalytic activity. Theoretically, the catalyst has infinite life. In actual operation it may be necessary to remove the inorganic dust accumulation on an annual or semi-annual basis. This involves a simple water washing procedure easily accomplished in the field. On the Austin installation, after initial adjustment had been completed, the system was run somewhat over 5,000 continuous operating hours without service or attention to the catalyst. Near the conclusion of this run, slightly objectionable odors began to pass through the system, indicating the need for field cleaning of catalyst elements. Similar elements have been used in a variety of industrial applications for periods exceeding 30,000 hours before requiring factory service. They are then exchanged for newly reactivated elements.

The manner in which the catalyst is employed for fume combustion can be seen from Figure 3, showing the internal flow arrangemnt of the system at the City of Austin. Odorous gases are drawn into the system, preheated by the gas burner before passage through the exhauster fan, and then discharged through the catalyst bed before release to stack. Fuel consumption is equivalent to 650,000 BTU per hour for each 1,000 CFM of 70 deg. F. air entering the system. On applications involving higher volumes, or where gas costs are high, a self-recuperative heat exchanger may be added to reduce fuel consumption to one-half or less.

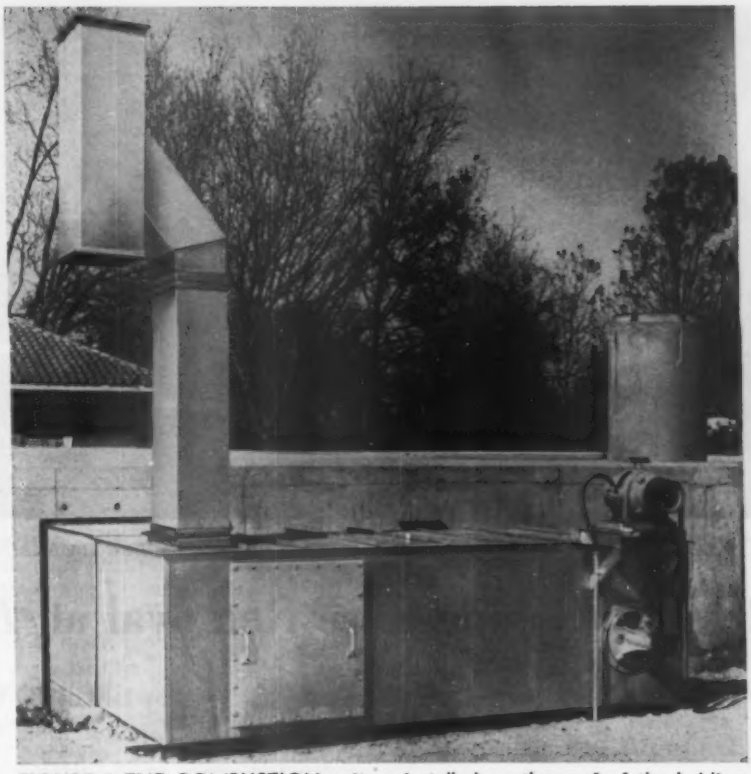
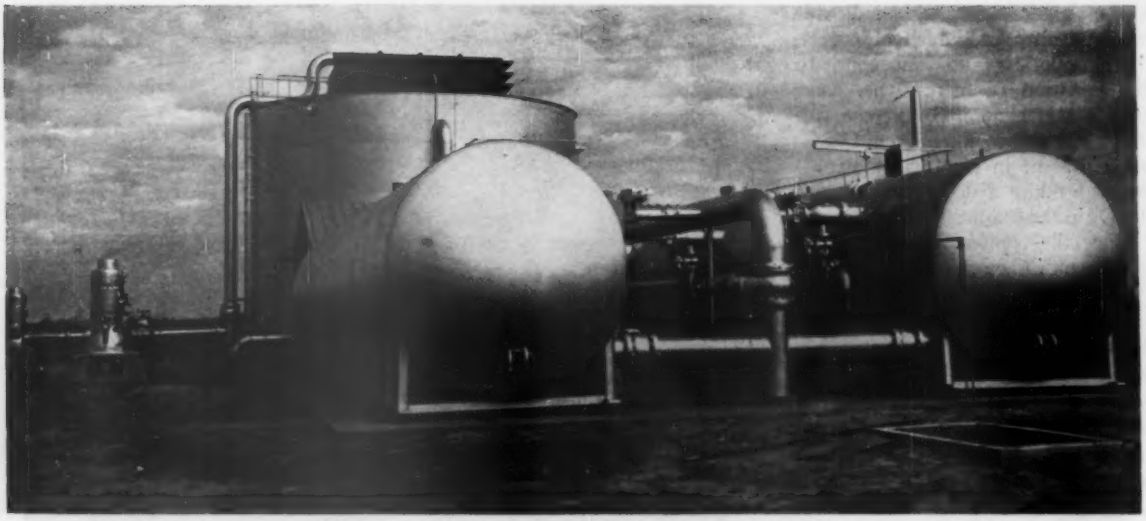


**FIGURE 3 THE COMBUSTION unit as installed on the roof of the holding tank at Austin.**

Naturally, heat is released in the oxidation of combustible matter, whether in flammable range concentration as used in conventional gas burners, or in exceedingly low concentration when combustion must occur by catalysis. Therefore, the temperature rise of the gases in passing through the catalyst element gives a precise indication of the energy release on the catalyst and, consequently the unit energy concentraton of the fume stream entering the catalyst. At the City of Austin, the normal temperature rise through the catalyst is 10 deg. to 30 deg. F., and rarely exceeds 50 deg. F. Consequently, the unit energy concentration is normally below 1-BTU in each cubic foot of 70 deg. F. equivalent gases leaving the holding tank. However, it is conceivable that an accidental release into the sewer system of highly volatile combustible material may enter the holding tank. For this reason, a limit protector is provided in the operating control panel, with thermal element on the discharge side of the catalyst. Through its use, an alarm signal and system fail-safe conditions are automatically provided should an unexpected surge of combustible vapors be released from the sewage in the holding tank. Thus a monitoring system, which will aid in giving indication, and alarm, when concentration of combustible vapors exceeds normal expected conditions is provided.

### Other Sewage Works Applications

Although several thousand industrial applications of this process are now in use in a wide variety of applications, the Austin installation furnishes the primary design information for destruction of odorous contaminants in other problems related to the sewage system.



THE McNEESE STREET 3000 gpm plant is one of two new installations for . . .

# Iron and Manganese Removal at *Lake Charles, La.*

by GEORGE WEST, Superintendent of Plants
Greater Lake Charles Water Co.
Lake Charles, La.

EDITOR'S NOTE: Three new wells and construction of two new iron and manganese removal plants make up the expansion program of the Lake Charles supply. This construction is of especial interest as it utilized an almost fully automatic plant.

■ AN ANALYSIS of the raw water, obtained at Lake Charles from deep wells, is shown in Table I. Until 1956 treatment was provided in a plant installed in 1926-1949 designed to remove iron and manganese by aeration, chlorination, copper sulfate treatment and gravity filtration from 3-5 mgd. At that time the demand had reached a maximum of 9 mgd, thus presenting an overload problem of sufficient magnitude that there was a need for immediate expansion of the treatment facilities.

Preliminary investigations indicated that the development of new well supplies in the immediate area of the existing treatment plant was not feasible. As a consequence, attention was given to the development of additional well sites at which a new or new treatment plants could be located. When exploration located two new well sites it was decided to carry out the expansion program by constructing two independent installations. Construction proceeded in three stages: (1) the installation of 1500 gpm well and treatment plant at Center Street site; (2) the installation of additional 1500 gpm well and treatment facilities at Center Street site for a total capacity of 3000 gpm; and (3) the installation of 3000 gpm well and treatment plant at McNeese Street site. When completed an additional treated water supply of 8.5 mgd will be provided.

Table I
Analysis of Raw Water

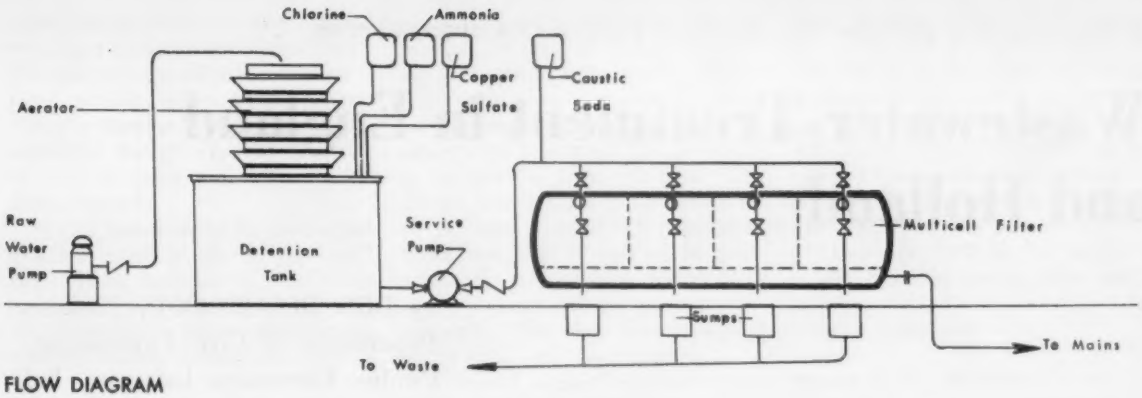
| | | | |
|---|---|---|---|
| Turbidity | Clear | Sulphates* | Trace |
| Total Hardness | 125 mg/L | Sodium* | 179 mg/L |
| Calcium* | 90 mg/L | Silica a $SiO_2$ | 53 mg/L |
| Magnesium* | 35 mg/L | Free $CO_2$ | 50 mg/L |
| Total Alkalinity* | 174 mg/L | Iron | 1.8 - 2.8 mg/L |
| Chlorides* | 130 mg/L | Manganese | 0.6 mg/L |
| pH | 7.0 | | |

* as $CaCO_3$

### Treatment Method

The treatment method provided for both plants is identical consisting of atmospheric aeration, chlorination, copper (copper sulfate) introduction as oxidation catylist for manganese, chlorination, ammonia feed, one hour detention, pressure filtration and alkali feed for pH correction.

The pretreated water at each site is filtered by 2—10′-0″ diameter x 62′-0″ long, three cell, horizontal multicell filters. The six filter cells utilizing anthraflit filter media operate in parallel at a filtering rate of 2.5 gpm/sq ft for a total flow of 3000 gpm. Each filter cell is backwashed individually at 12.0 gpm/sq ft for a total backwash rate of 2400 gpm. The use of a collector section common to all filter cells permits simultaneous filtering and backwashing. For example, five filter




FLOW DIAGRAM

cells remain in normal operation to supply filtered water for backwashing the sixth filter cell. No previously filtered water is returned from storage; in fact, 600 gpm of treated water flows to service during the backwashing operation.

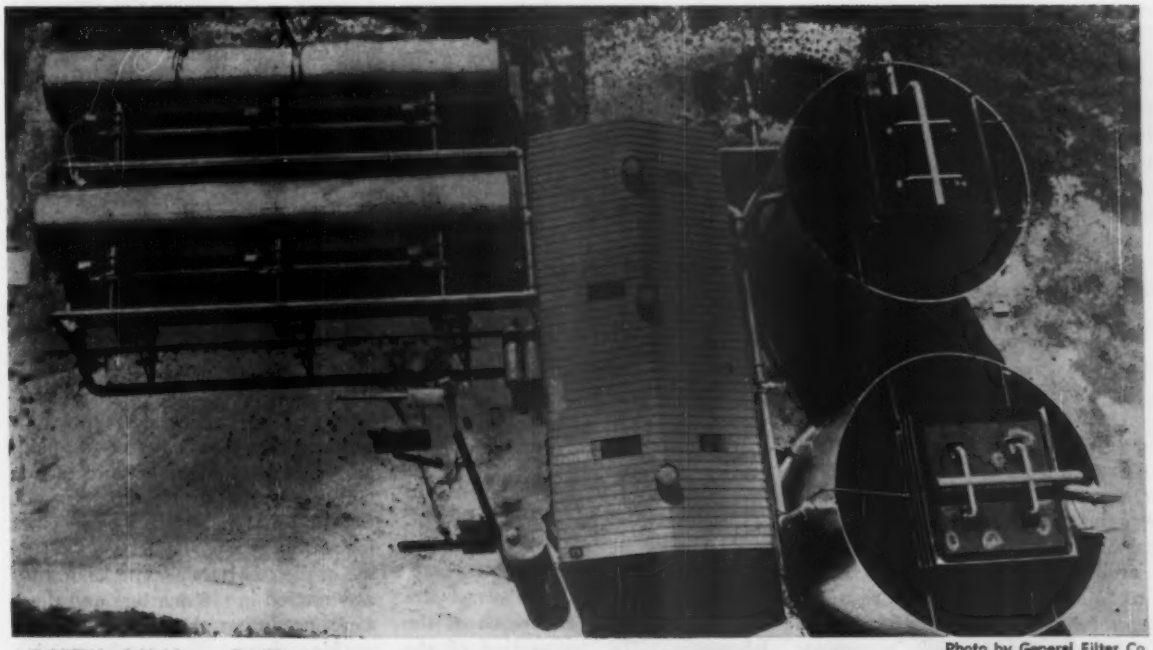
In the overall plant control the service pumps are operated from demand by a pressure control on the system and in turn controlled by a safety low level cut off in the detention tank. The well pumps are balanced against the service pumps by electrode level controls in the detention tank and a float operated butterfly valve also operated from water level in the detention tank. The pumping control is fully automatic.

It was desired that the two new plants be operated automatically with inspection and maintenance handled by existing operating personnel stationed at the original treatment plant. For this reason the backwashing of the filter cells was also arranged for automatic control. This is accomplished by a pressure differential indicator-recorder controller which initiates a timer controlled backwashing cycle to backwash each filter cell and return it to operation in proper sequence until the total 6 cells have been backwashed. The valve operation is pneumatic with no operator attention required other than inspection, recharging chemical feeders and routine maintenance.

The Lake Charles plant design provides for indication of flow to each of the six filter cells and indication as well as positive control of the backwashing rate. An important feature in the multicell filter design is that backwash water may be obtained from the in-service cells, from storage, or a combination thereof with no change in valve operating or plant control. Essential to this flexibility is the use of a retard type backwash gauge on the backwash water outlet line for flow indication and use of a positioning type waste water valve for flow control.

**Table II**
**Chemical Requirements**

| | | |
|---|---|---|
| Chlorine | 50 | lb/MG |
| Copper Sulfate | 10 | lb/MG |
| Ammonia | 10 | lb/MG |
| Caustic Soda | 10.5 | lb/MG |
| Residual copper in treated water | 0 | mg/L |



AIR VIEW of McNeese St. Plant

Photo by General Filter Co.

A European trip provides this American point-of-view observation on . . .

# Wastewater Treatment in England and Holland

by DON BLOODGOOD, Professor,
Department of Civil Engineering,
Purdue University, Lafayette, Ind.

EDITOR'S NOTE: Last summer, Prof. Bloodgood presented a paper at the annual meeting of the Institute of Sewage Purification held at Southport, England. During his stay in Europe, Professor Bloodgood had an opportunity to visit several wastewater treatment installations in England and Holland. His observations on these installations are presented here.

### Water Pollution Research Laboratory

When visiting the Water Pollution Research Laboratory at Stevenage and interviewing Director B. A. Southgate, I was given the opportunity of visiting all parts of the laboratory and was told about their many undertakings. Dr. Southgate is pleased with a new idea that is taking hold in England which is the sponsoring of research with funds supplied by industry. The Laboratory at Stevenage is similar to the Taft Center Laboratory of the Public Health Service in Cincinnati but the English laboratory is operated on a much smaller scale.

They are making studies on the organic constituents of the dissolved solids in sewage. To prevent changes in characteristics in solids the dehydration is being accomplished by freeze drying.

The laboratory is also working on the development of a portable dissolved oxygen recorder. They were conducting tests out of doors with troughs to determine rates of take-up of oxygen from the atmosphere. This, it seemed, was basic research and it was interesting to find them doing basic studies as well as applied research. The English are giving attention to detergents and they are studying the effects of these materials on several processes used in sewage treatment. An observation of streams and sewage plants leaves one with the feeling that the English have more trouble with foaming detergents than that encountered in the United States.

The Water Pollution Research Laboratory has built two rectangular trickling filters for testing purposes. The stone is retained in brick walls that have openings for ventilation. The waste will be applied by distributors that move lengthwise over the beds. It is believed that the first tests will be on wastes from the meat packing industry.

There are tests being made at the Water Pollution Research Laboratory on anaerobic digestion. These are being conducted in 200-gallon insulated tanks that are operated in the open air.

The tests where laboratory activated sludge units are being operated have been built on a framework of perforated angles (about 1½") of galvanized iron or aluminum. This seems to be an excellent idea because the angles are bolted together and the framework can be dismantled and reused or stored in a relatively small space.

The Water Pollution Abstracts are made by a group of women at the laboratory. The preparation of the abstracts is the full time work of a staff of three or four people. This attention to abstracting explains the high quality and thorough coverage of the abstracts.

Studies at the laboratory are being conducted on the filtration of sludges. This is a fundamental study that is a continuation of the work started at Manchester and reported by Dr. Coakley. The English still seem very much interested in aluminum oxychloride as a coagulant. It is not apparent to the author the chemical difference between this compound and aluminum chloride.

The Laboratory has developed methods for the aquarium testing of toxic substances with small fish, using extremely small cells for retaining the fish under controlled dissolved oxygen temperature conditions.

### Manchester Plant

At the Manchester works there is much activity in building new facilities and experimenting with new ideas. The old sections of the plant are in bad condition because of age and necessity of overloading of units. Before a start could be made to see the works it was necessary to have tea in the laboratory. The laboratory was housed in old quarters and there were not more than three or four working there. The brush aeration

experimental plant was observed and it was producing an excellent effluent. The raw sewage effluent contained a large portion of industrial wastes. Some indication of the presence of industrial wastes was the existence of lavender foam or froth in the effluent channel.

A visit was made to the mechanical aeration units of the "High-Cone" type. These units are in great favor at Manchester. The engineers stress the comparative power consumption between mechanical aeration and diffused air methods but state that the detention time is much shorter than for diffused aeration. They have gone to great lengths to develop the "High-Cone" aerator but it was not apparent that they had done anything to improve the diffused air system. They are apparently using a high concentration of solids in the aeration tank and must consequently be using a considerable amount of horsepower to get the required aeration.

### Wigan Plant

New additions were being made to the "Hoscar" plant at Wigan. The plant still uses two sedimentation tanks than were constructed in 1896. The expanded facilities will take care of about 6.0 mgd of sewage contributed by 105,000 persons. In the new section of the plant there are four radial flow settling tanks. Two new batteries of trickling filters containing 2½" honeycombed blast furnace slag have been built. These filters are six feet deep and the bottom layer of slag covering the filter tiles is six inches in diameter. The sewage is distributed on the beds with 22 "Cresset" machines. These filters are designed so that a 1:1 recirculation ratio of sewage to effluent can be maintained.

The combined sludges from the sedimentation processes are consolidated in a tank before pumping to two single stage heated digestion tanks.

There are three 165 h.p. gas engines that operate at 600 r.p.m. and they drive 112 k.w. generators.

### Parr Works

In England, each sewage plant has some particular name. The description of the plant starts out like this, "The newly constructed sewage works at St. Helens is situated at Parr." The new works replace the original ones that were built in 1904. The old process consisted of liming the sewage with settling in large tanks. These large tanks have now been converted and are now used as holding tanks for storm water treatment. The new plant is designed to treat 7.2 mgd. The Rivers Board requires that flows up to 20 mgd receive full treatment, flows from 20 to 40 mgd will be given screening and settling while flows above 40 mgd will be given screening only. The flow figures are in terms of United States gallons.

Activated sludge treatment with diffused air is the method of secondary treatment. The sludges are digested and then dewatered on vacuum filters that are the first of their kind in the northern part of England. The gas from digestion is used in engines for the production of power.

A particularly interesting feature of the St. Helens plant is the reuse of 4.8 mgd of plant effluent for cooling water at the Bold Power Station of the Central Electricity Generating Board located about two miles from the treatment works.

The grit from the detritor is removed by grit pumps and discharged to a grit washer. The two sedimentation tanks are modified square in shape and have a nine foot sidewall depth with nearly flat floors. The seven aeration tanks have twelve foot water depth and are 230 feet long, five are 20 feet wide and two are 10 feet wide. Either of the two narrow tanks can be used for either normal aeration of sewage or re-aeration of returned activated sludge. The air diffusion is through 7" diffuser domes in ridge and furrow arrangement with four lines of domes in the wide tanks and two lines in the narrow tanks.

The final settling tanks are 75 ft. in diameter and they are located across the river from the aeration tanks.

The waste sludge is digested in two fixed cover tanks. The tanks are heated by circulating the sludge through a heat exchanger where the heat is supplied from the circulating water of the gas engines. Gas from the digestion tank is stored in a separate floating circular gas holder. The 45 ft. diameter tank in which the gas holder floats provides the only secondary digestion available in the plant.

After digestion the sludge is pumped with approximately nine volumes of plant effluent to a circular elutriation tank that is 45 ft. in diameter and 13 feet deep. The overflowing elutriation is returned to the raw sewage. The sludge is conditioned with chlorinated copperas prepared at the plant. The conditioned sludge is pumped to two 14 ft. long 8 ft. diameter rotary vacuum filters.

All power used in the works is produced in the power plant which has four dual fuel engines that drive 255 k.w. generators.

### Atomic Energy Research

At Harwell, the location of the research laboratory of the Atomic Energy Research Establishment, no difficulty was experienced in obtaining clearance to visit the waste treatment facilities but declassification of the waste treatment activities made it possible to visit all phases of the waste treatment by merely submitting my passport number some weeks in advance of my visit. Mr. R. H. Burns is in charge of the waste treatment facilities. Dr. C. B. Amphlett is working on newer methods for waste disposal and he is not in the same group as Mr. Burns, though they seem to be working together very closely.

In England no disposal of radioactive waste can take place without the permission of the appropriate controlling authority which in the case of the United Kingdom Atomic Energy Authority is the Minister of Housing and Local Government and the Minister of Agriculture, Fisheries and Food.

The liquid wastes from the Harwell establishment are discharged under controlled conditions to the Thames River. The activity in the effluent from the establishment is considered in four classes and the tolerance levels of these classes are as follows:

Radium $4 \times 10^{-10}$ micro-curies/ml.
Other $\alpha$-emitters $2.4 \times 10^{-9}$ micro-curies/ml.
Radio-calcium, Radio-strontium } $2 \times 10^{-8}$ micro-curies/ml.
Other $\beta$-emitters $1 \times 10^{-6}$ micro-curries/ml.

It is said that these levels are such as to provide a factor of safety from 10 to 100 in order to protect the public. The relative toxicities of the materials taking the other $\beta$-emitters as unity are: 2500 for Radium, 420 for

other $\alpha$-emitters, 50 for Calcium and Strontium.

The amount of any one of these materials or a combination of any or all that can be discharged to the Thames River in any month is 20 curies. The amount is computed by taking the relative toxicity and the harmonic mean flow of the stream.

There are four systems of liquid waste disposal at the Harwell establishment. They are:

1. Domestic sewage
2. Low level wastes
3. Medium level wastes
4. High level wastes.

The domestic waste is treated in a conventional trickling filter waste treatment plant. They are having difficulty in digesting the sewage solids. This was an interesting fact because there is not supposed to be any material discharged to this system that will be harmful to microorganisms. Our experience with detergents inhibiting digestion makes me now wonder if it could be possible that there are sufficient quantities of these materials in the sewage sludge to inhibit growth of the organisms that decompose sewage solids.

The low level wastes from the establishment are held in tanks until they are monitored. The level of radioactivity in these wastes is always so low that they can be discharged to the Thames through the diffusion manifold without prior treatment.

The high level liquid wastes are collected and they are either stored for aging or they are shipped to sea.

The medium level liquid wastes are treated with standard weighting and flocculating agents such as activated silica, alum and phosphate. This method of treatment is satisfactory and is sufficient to make it possible to discharge the bulk of the wastes from the Harwell establishment safely and economically to the Thames. The settled solids from the coagulation process are collected and the sludge is first frozen. This frees the entrained water. After thawing the water is pressed from the solids and the semi-dried sludge is placed in drums that are shipped to sea. There is a relatively small amount of this solid material that must be disposed of in the above manner.

It is regretted that it was not possible to obtain pictures or slides of the operations. One of the first procedures after arrival at the establishment was the checking of one's camera.

## Holland

### Hilversum

The sewage received at the Hilversum plant contains considerable industrial wastes and a recording pH meter is used to keep a record of the changes in the waste being received.

One of the very interesting things at the sewage plant was the housing for the grit chamber and screening devices. The building was closed on three sides but open on one side, much like cattle sheds in America. This idea of an inexpensive covering for equipment might well be used in this country.

The Hilversum sewage treatment plant is of the activated sludge type with aeration being supplied by Kessener designed brushes. These are stainless steel fins set into a gravel shaft with the steel kept in place with lead wool tapped into place.

The return of activated sludge is accomplished by a rotating bucket wheel that is driven by the same motor that drives the brushes. The entire power system for the activated sludge plant is located in a pit in the vicinity of the aerators and a sliding steel cover encloses the equipment. This is another inexpensive way of housing equipment. There are five brush two-pass aerators at this plant.

Considerable attention was evidently given to the design of conduits for carrying sewage. The changes in direction of flow are accomplished with well-curved bends in concrete. There is a great deal of attention given to the distribution of sewage to the units of a plant. It has been my experience that this matter is often neglected in the design of our American plants.

The secondary settling tanks are equipped with concrete and tile overflow weirs. This is only possible where the workmanship in construction is almost perfect. I doubt whether the U. S. could undertake such a structure unless we were as short of steel as they are in Europe. The shortage of steel or our great abundance of it is noted in structures all over Europe.

There are three digestion tanks at Hilversum. One of these is rectangular with a floating cover. We do have rectangular digestion tanks in America but they are quite unusual. The gas produced is used in gas engines. It is interesting to note that they were overhauling one of the engines, a task that is well-known in our American plants. During the war, gas from the Hilversum digestion tanks was compressed and used for fuel in trucks.

The effluent being discharged at the Hilversum plant was clear and there was an abundant green growth on the secondary settling tank weirs indicating that a good effluent is the usual. The quality of the effluent is mentioned because there will be some readers of this report who will want to know whether it is possible to treat satisfactorily a sewage containing domestic sewage and industrial wastes by the brush aerator method.

### Tilburg Plant

The Tilbury plant in Holland is quite beautiful, being well-landscaped with trees and flower gardens. There is a considerable amount of industrial waste treated along with the domestic sewage at this plant. In fact, it is necessary to provide some pre-treatment to the sewage at certain times before it is given complete treatment in the brush aeration activated sludge plant.

One of the several unusual things observed at the Tilburg plant was a method of removing grit from the grit chamber. The cleaning of the grit chamber is accomplished by vacuum. The vacuum equipment is moved along a track on the top of the channels and the grit is sucked into a tank that is a part of the equipment. The grit is later discharged from this tank and carried away for ultimate disposal.

Even in the brush aeration system foam has been a problem. The Dutch like the English attribute the excessive foaming to the use of detergents. Banks of foam on one set of aeration tanks were several feet high but it was noted that on others the foam seemed to be under control. Mr. E. G. Schumacher had designed and patented a simple curved covering for a part of the aeration tank on the side opposite the brushes. The device seems to compress the foam and thereby keeps it in the tank and well under control. This is an idea that should be tried in some of our Amer-

ican diffused air activated sludge plants.

There is opportunity to vary the amount of aeration with the brush system. On first thought this would seem to be impossible but it is accomplished in quite a simple manner. The amount of aeration accomplished and consequently the amount of energy required, depends upon the degree of submersion of the brushes. Instead of lifting and lowering the brushes, the regulation in aeration is accomplished by changing the surface elevation of the mixed liquor in the aeration tank. The elevation in the tank liquid is changed by adjusting a weir on the outlet end of the aeration tank. The weir elevation is adjusted by moving one arm, by this method the rate of aeration can be changed in a matter of seconds.

There were absolutely no indications that it was impossible to provide all of the aeration needed for treating a strong waste by activated sludge using brush aerators.

### Volkel Air Camp

This small plant was all built above ground. The height above ground was quite a considerable distance because the settling tanks were conical in shape and without cleaning mechanisms and the steepsided tanks were entirely above ground.

The effluent being discharged was excellent and the high degree of oxidation being accomplished is demonstrated by the analyses that were furnished. For instance, the nitrate content of the effluent was 19-23 mg./l. and the B.O.D. 3 mg./l.

This plant is handling the waste from 2500 persons during the daytime and from 700 to 800 during the night. The aeration tank volume is 93.7 $m^3$ and the dry weather flow is 400 $m^3$/day. Estimating a return sludge flow of 25% the detention time would be about 4½ hours and the loading would be about 21 pounds of B.O.D. per 1000 cubic feet of aerator capacity. This is a unit loading about equal to that used in many American plants. The power used for aeration and returning sludge amounts to 2.46 k.w. (3.3 h.p.) or 0.856 k.w.h. per pound of B.O.D. to the aeration units.

This plant was most interesting and it is an excellent illustration of what can be done in the way of waste treatment with a minimum expenditure for equipment. It was amazing to see the exceptionally clear effluent being produced by these small brush aeration units.

### Eindhoven Barracks

The plant at the barracks near Eindhoven was designed in 1938, put in operation in November 1939, and it has been in operation since that time. This plant is all below ground level, there being no buildings in connection with it. The motor drives for the return sludge wheel and brushes are located in a pit similar to those used in the other plants visited.

The plant was designed to serve a population of 1000 and the number of contributors has ranged between 500 and 1500 with an average of 850. The power consumption for this plant is now 950 watts and of this wattage 158 watts are required in the 1.5 h.p. motor and in the friction of the reduction gears and the bearings.

The effluent was clear and sparkling and there was every reason to believe that the plant operates well all of the time.

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## Cleveland's Water Supply Costs Over $2.50 for Each gpm Increase

Cleveland's water supply was increased 50 mil gal a day by the new Crown Filtration Plant.

The plant brings the daily capacity of the Cleveland water system to 515 mil gal. The new plant can be expanded to 140 mil gal daily capacity.

Located on a 57-acre site at Clague and Detroit roads in Westlake, the plant will serve the fast-growing portion of Cuyahoga County west of Rocky River, which often has been plagued by water shortages in recent summers.

The Crown Filtration Plant and its appurtenances represent an expenditure of approximately $19,500,000. This includes the cost of the intake crib, 2¼ miles offshore in Lake Erie, and the 13,000 feet of eight feet diameter concrete pipe for moving the water to the shoreshaft where it is transferred to a 3600 ft concrete lined tunnel leading to the plant.

In the plant, the water undergoes complete treatment involving coagulation, sedimentation, filtration and chlorination.

Filtered water is pumped to the 15 mil gal underground reservoir, in use since 1955, or the reservoir can be bypassed and the water pumped directly to the water distribution mains.

An outstanding feature of the plant is the system for handling alum and lime purchased in carload lots. These dry bulk chemicals, for coagulation aid and corrosion control, are removed from the cars and transferred to storage bins by a vacuum tube system. Powdered activated carbon, for taste and odor control, is stored in individual bags. Liquid chlorine is purchased in pressure cylinders.

Cleveland's water system began serving the county's westerly suburbs in 1923 with a 12-inch main crossing Rocky River. Over the years the service was expanded until today there are five mains, up to 36 inches in diameter, crossing the river.

But the increase in population and in the per capita consumption of water, coupled with a limit on existing plant capacity and greater distances between source and consumer, brought an urgent need for an entirely new intake and treatment and pumping plant located in the area.

The plant is illustrated below.

Chemical Treatment for Water Clarification requires an understanding of . . .

# The Jar Test; *Its Use*

PART III

by MARVIN LANE, Technical Manager,
Graver Water Conditioning Co.,
New York, N. Y.

**EDITOR'S NOTE: Parts I and II of this series discussed the theory of coagulation and selection of coagulants. This part, the last, concerns how to evaluate the conditions and adjust chemical dosages to effect good coagulation and sedimentation. The entire series was designed to provide better understanding of chemical treatment for water clarification.**

■ THE JAR TEST is a reliable method of determining the proper chemical conditions in the treatment of a water supply. The following discussion tells what equipment and supplies are needed to conduct a jar test and what procedures to follow.

## Equipment

For best results, a multiple stirrer with variable speed adjustment is an essential piece of equipment. It provides good control of the method of agitation and insures that all jars will be handled in exactly the same manner. Figure 1 shows the multiple stirring apparatus used in the Graver laboratory. The unit is a 6-jar stirrer available from the Phipps & Byrd Company in Richmond, Virginia. Similar stirrers are available from other manufacturers.

The jars are illuminated from the bottom by fluorescent bulbs in a case covered with frosted glass. A separate clear glass support is mounted above the light with an air space of about 1 inch to prevent the heat of the light from causing convection currents in the settling samples. The problem of convection currents can also be avoided by placing the lights behind the apparatus, but this is a little harder on the operator's eyes, particularly when a large number of samples are to be tested. The lighting equipment was designed and built in the laboratory.

In the field, multiple stirrers are not often available and it is necessary to hand stir the samples. It is possible to provide two or three stirrers on one shaft and run more than one sample manually, but it is usually best to run one at a time. The rules for the degree of agitation for the flash mixing and slow mixing periods given for mechanical stirring apply as well to manual stirring. Mechanical stirring should be used, wherever possible, because it speeds up the work and gives more reliable results.

It has been found most convenient to run jar tests on 500 ml samples in 600 ml beakers. This works out well with the multiple stirrers. It provides sufficent depth of sample to observe the results with ease and provides sufficent sample for analytical purposes. However, this is not a critical thing. Larger samples can be run or, where the amount of sample available is small, 200 to 300 ml samples can be tested.

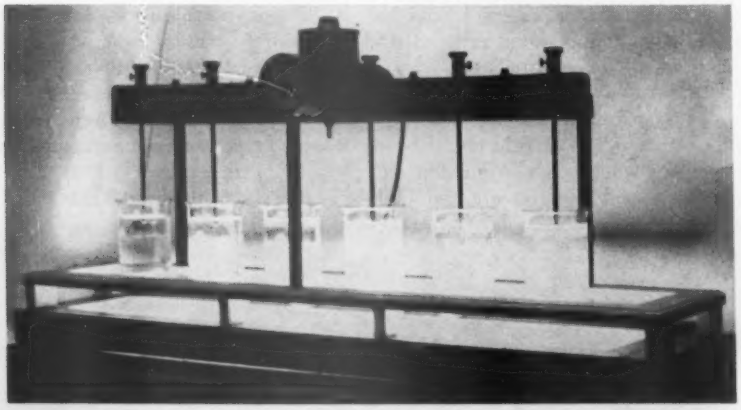

**FIG. 1—VARIABLE SPEED multiple stirrer with specially designed bottom lighting.**

## Chemical Reagents

As mentioned in Part I of this article there are six basic types of chemical reagents which may be needed in order to produce a satisfactory treatment. A supply of each type of reagent should be available to run these tests either in the laboratory or in the field. Since it is frequently difficult to obtain all of the reagents in the field, Jar Test Reagent Kits have been designed which contain practically every reagent needed in coagulation test work. A photograph of this kit is shown in Figure 2.

Each reagent in the kit is accurate-

ly weighed into a small vial. It is only necessary to empty the entire contents into a given volume of water in order to have an accurate standard solution or suspension of the reagent. Table 4, shows the concentrations of reagents which have been found most convenient for running these tests. In the Jar Test Reagent Kit, most of the vials contain 8.1 grams of the reagent which when made up to 1 quart make a solution or slurry concentration of 500 grains per gallon. This concentration is a convenient one for treating 500 ml samples, because 1 ml of reagent is equivalent to a dosage of 1 grain per gallon.

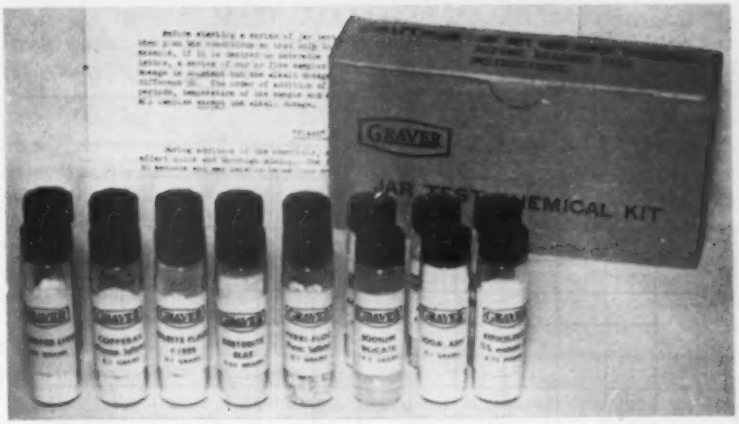


FIG. 2—JAR TEST Reagent Kit provides all of the commercially used treatment chemicals in concentrated form for use in the field. The contents of a vial added to a quart of water makes an accurate standard solution or suspension.

## Planning and Performing The Tests

Before starting a series of jar tests, determine the purpose of the tests, then plan the conditions so that only the factor being studied is varied. For example, if it is desired to determine the effect of pH on the floc characteristics, a series of four or five samples should be run in which the coagulant dosage is constant but the alkali dosage is varied so that each sample has a different pH. The order of addition of the chemicals, flash mix and slow mix periods, temperature of the sample and all other variables should be the same in all samples. Only the alkali dosage would vary.

When the primary object of the jar test work is to determine the most suitable coagulant, then it is necessary to run at least one series and usually several series of each coagulant or combination of coagulants. The first series generally involves the addition of a fixed dosage of the coagulant (in most cases this would be alum) and a variable dosage of lime, soda ash or sodium hydroxide in each of the jars.

Depending upon the results obtained in this first series, a second series will usually be run over a narrower pH range using smaller differences among the jars for alkali dosages, but otherwise keeping the coagulant and its dosage the same as in the first series. Sometimes at the end of the second series, the optimum pH range is definitely established, but in other cases, it may be necessary to run additional series in order to clearly define the optimum pH band for that coagulant at the dosage level.

If it is then desired to investigate the possibilities of an iron coagulant, then the same procedure could be repeated with, say, ferric sulfate, and the results obtained at its optimum pH would then be compared with alum at its optimum pH.

It is important to have the object of a particular series in mind at the start of the tests and to set down the test conditions on data sheets so that the object of the test will be realized at the end of the series. It is particularly important to be sure that no variables exist other than those being studied in a given series. It is frequently desirable to duplicate the optimum results obtained in a previous series, alongside of a new series so that the reproducibility of the tests can be ascertained and also to provide a side by side comparison with some new condition.

### Flash Mixing

During the addition of the chemicals, stir the same vigorously in order to affect quick and thorough mixing (60-80 rpm on a mechanical stirrer). The flash-mix period should not be less than 30 seconds and may usually be as long as 3 or 4 minutes without doing any harm. If the water is warm and the floc forms quickly, then there is some danger that a long flash-mix period will cause the floc which forms to break up. Under such conditions, it is better to run fewer samples or to get help in adding the treatment chemicals so that the flash-mix period can be shortened.

In adding the chemicals, too rapid addition should be avoided and approximately the same rate of addition should be used in all samples. With some waters, the order of addition of the alkali, coagulant and coagulant aid is important. This is particularly true when a coagulant aid is used. The effect of the order of addition of the chemicals should be investigated.

### Slow Mixing

The purpose of the slow mixing period is to keep the floc particles in intimate contact with the water and circulating continuously. If the stirring is too vigorous, the floc may break up and the results may be

Table 4

Reagent Concentration

| Sample Volume | Grams per Liter | Grams per Quart | Grains per Gallon | ml of Reagent Equal to Dosage of 1 Grain/Gallon |
|---|---|---|---|---|
| 500 ml | 8.55 | 8.1 | 500 | 1.0 |
| 1000 ml | 8.55 | 8.1 | 500 | 2.0 |
| 1 quart | 8.08 | 7.65 | 473 | 2.0 |
| 1 gallon | 6.49 | 6.12 | 379 | 10.0 |

GRAVER WATER CONDITIONING CO.

JAR TEST DATA SHEET

Series No: _____ Purpose:
Place: Date: _____

Raw Water
Turbidity _____ Flash. Mix _____ Min. _____ rpm
Color _____ Slow " _____ Min. _____ rpm
Alk. M. _____ Temp. (°F.) _____ start _____ end
pH _____

| Jar No. | Gr/Gal Alum | Soda | Lime | | | ppm SiO2 | Settled Turb. | pH | Filt. Color | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

CHARACTER OF FLOC DURING SLOW MIX PERIOD
OBSERVATIONS

| Min. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

SETTLING OF THE FLOC
OBSERVATIONS

| Min. | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

CONCLUSIONS

FIG. 3—DATA SHEET

poor. If too little stirring is used, the clarification and color reduction may not be as complete as possible under the conditions of the test because the growing floc is not being brought into contact with the impurities which it is to remove. Just sufficient agitation should be used to keep the floc uniformly suspended from top to bottom of the sample. Excessive agitation should be avoided, particularly when treating low temperature samples in which the floc tends to be fragile.

In most large-scale coagulation or softening equipment, the slow mixing period is usually 15 to 20 minutes and, for this reason, the same period should be used in the jar tests.

Throughout the slow mixing period, the samples should be observed carefully and the observations recorded. A typical "Jar Test Data Sheet" is shown in Figure 3. The rate of formation of the floc, as well as its size, are important. The appearance of the water between the floc particles should be observed and recorded. Is it sparkling clear? Hazy? Clear but colored? The size of the floc may be described as:

| Approx. aver. particle size | |
|---|---|
| Pin-Point | Extremely Fine but visible. |
| Fine | 1/64 inch |
| Small | 1/32 inch |
| Fair | 1/32 to 3/64 inches |
| Good | 3/64 to 3/32 inches |
| Large | 1/4 inch and larger |

The dimensions given are only a very rough scale for evaluating a floc. The size of the floc is but one criterion of the effectiveness of a set of treatment conditions. The rate of settling of the floc is more important, and the quality of the supernatant water after settling is equally important. All of these points must be observed and recorded.

Generally, the larger the floc particles, the more rapid is its settling rate. However, on certain waters, such as low turbidity, highly colored waters, a large or shaggy floc may settle much slower than a smaller, denser floc.

In reporting jar test observations, beside describing the floc in each jar, it is good practice to give a comparison of the various jars in the series. If there are observable differences, state which jar is best, which is worst, and where the others lie in the series.

## Settling

At the end of the slow-mix period, stop stirring and allow the floc to settle quiescently. Observe the settling carefully until all of the floc is on the bottom of the jar or for 15 minutes, whichever is shorter. Report the settling as inches of clear water above the floc at 2 minute intervals, or more frequently if the floc settles rapidly. Even with the best coagulating conditions, usually a few individual floc particles remain suspended after the bulk of the floc is completely settled. The amount of these "stragglers" should be noted and recorded.

The following scale may be used as a rough standard for evaluating settling rates of flocs in jar tests. It is based on the period required for the floc to settle 4 inches, which is the approximate depth of a 500 ml sample in a 600 ml beaker.

| Minutes to Settle 4 inches | Remarks |
|---|---|
| Less than 2 | Excellent: Will give excellent results in upflow solids-contact machines at relatively high rates. |
| 2 to 4 | Good: Will give good results in upflow solids-machines at moderate rates. |
| 4 to 7 | Fair: Will give satisfactory results in upflow unit if rising rate is low. |
| Greater than 7 | Poor: Unless a low rising rate is used, poor results will be obtained. |

## Treated Water Quality

Generally, the pH, color and turbidity of the supernatant liquid are measured after 15 minutes of settling. In order to save time, a sample for pH determination can be taken toward the end of the slow-mix period. The turbidity of the supernatant can be measured after 15 minutes settling. This is done by decanting the sample into a 50 ml Nessler tube and comparing it with standard turbidity suspensions in matched Nessler tubes. A Baylis or Hellige turbidimeter may also be used. Another convenient method is to prepare standard suspen-

sions in the same size vessel as the samples are being run in and make the comparison by settling the vessel containing the settled sample alongside the well stirred turbidity standards[2].

Color is measured by the APHA standard method using Nessler tubes or the comparators such as those made by La Mott or Taylor. If chlorine has been added, the residual chlorine should be measured after 30 and 60 minutes. Frequently iron, alkalinity, silica and, in the case of lime-soda softening tests, total hardness, and calcium hardness are also run on supernatant samples as well as filtered samples.

If the quality of the water after filtration is required, the settled sample should be decanted into a funnel containing a small plug of absorbent cotton. Press the cotton down into the stem of the funnel with a stirring rod. With a properly prepared cotton plug, the sample should filter in the range of 75 to 150 ml/min. It is good practice to discard the first 75 ml of filtrate. A fresh cotton plug should be used for each sample. Some workers prefer filter paper. A Whatman No. 41-H, acid-treated, fast-filtering paper is satisfactory.

### Solids-Contact

Attempts have been made to study the effect of solids-contact on the treatment in jar tests by running several tests or running one large sample under optimum conditions and accumulating the sludge, and then adding the sludge to a fresh sample with the other reagents. Reliable results are rarely obtained in this manner. Frequently, the added sludge increases the turbidity of the supernatant water, and at best, it produces no noticeable difference in the jar.

This does not mean that it is ineffective in the machine, but merely means that the technique used does not show the true effect of the sludge. The fact that the sludge is effective can readily be shown in any operating machine by removing all of the sludge by blowdown and operating without any accumulated sludge for some time and then permitting the sludge to accumulate and running under exactly the same conditions of flow rate and water conditions. This is done in every plant during the start up and the benefits of sludge contact are invariably seen in this way.

It is not advisable to study this factor in jar tests because the technique described above is sufficient to establish an effective treatment which can be utilized successfully in large scale equipment. Where the effect of solids-contact is felt to be sufficently important, a pilot plant should be installed so this factor can be studied properly.

### Summary

This series of articles has presented the basic concepts of colloidal chemistry which apply to the coagulation process. The various coagulants commonly used today are discussed with their limitations and various advantages and disadvantages. The application of information from existing plants to new plants is considered, and certain precautions in using this kind of information are discussed. The procedure for selecting the coagulant by means of properly run "jar tests" is described. This same procedure applies to the entire treatment, including the study of the effect of prechlorination, coagulant acids, and weighting agents.

This information will be useful to those who need to determine the clarification or softening characteristics of a supply for a new plant or who are responsible for the selection of equipment for existing plants, or those who are involved in the day to day operation of clarification equipment. The jar test procedure in its present form, as presented in this paper, has been used for the past six years very succesfully.

Although it has been said that there is more art than science to this business of determining the required treatment conditions, there is a great deal more science involved than many realize. The science lies principally in the scientific planning and carrying out of the tests. It also applies to the the completely objective observation and recording of the results obtained. One of the main sources of difficulties experienced on equipment in the field is due to improper chemical treatment, and the major reason for the operators themselves not being able to cope with the difficulties is a lack of understanding of the correct procedure for determining the best treatment. It is hoped that this paper will be useful in solving these kinds of problems.

#### Reference

1. Graver Water Conditioning Co., "Jar Test Instructions".
2. Standard Method for Examination of Water and Sewage, American Public Health Association, 1555.

## World's Largest Saline Water Conversion Installation

The world's largest single installation to convert sea water to fresh water has gone into operation in the Island Territory of Aruba, Netherlands Antilles. This is said to be the first unit to combine salt water distillation with production of marketable surplus electricity. This process combination results in lowered costs for producing drinking water from the ocean.

Total capacity of the new plant is 2.7 mgd of distilled water. This is more than enough to supply the potable water requirements of both Aruba's population of 55,000, and its major industry—the American-owned Lago Oil & Transport Co. Ltd. refinery, one of the world's largest, with a rated crude capacity of 440,000 barrels per day.

Aruban officials predict that the surplus of water and electricity available from the installation will be a considerable factor in rapid development of the island, whose rainfall averages less than 15 in. annually.

Prime reason for lowered water cost is the use of a steam electric plant in conjunction with the distillation units. As in conventional power plants, steam generated in high pressure boilers has most of its energy converted to electricity which can be sold. The exhaust steam from the turbine is not condensed at Aruba, however, but is used to distill the sea water.

Cost figures for water from the new plant have not been released, but Aruba Government estimates indicate a production cost of about $1.75 per 1000 gallons. When the turbo-generators with their 15,000 kilowatt maximum output go into operation later this year, exact water cost data reflecting power revenues will be available.

This year's meeting included the dedication of Cincinnati's. . . .

# New Sewage Treatment Works

A Meeting Report
by WILLIAM A. CAWLEY
Associate Editor

■ Among the features of this thirty-third annual meeting was the dedication of the new Mill Creek Sewage Works. An inspection trip through this 120 mgd primary plant following the dedication was also part of the meeting. Paper presented at the technical sessions, several of which are abstracted below, covered many aspects of the sewage and industrial waste treatment field.

### Centrifugal Treatment of Sewage and Indutrial Waste

W. H. White, Application Engineer, Bird Machine Co.

Recent developments in sewage treatment and in the application of centrifuges has resulted in several installations of this type of equipment on the west coast. An installation was made at Daly City, California. The wastes are almost entirely domestic from this residential area located south of San Francisco. The treatment plant is located adjacent to the City Park which prevented the use of sludge beds. The centrifuge installed was a standard industrial machine rather than one designed specifically for this plant which provides primary treatment with one primary digester. Sludge is withdrawn from the digester approximately four hours a day, 3 days a week, to maintain the balance within the digester. The sludge if fed to an 18 in. x 28 in. centrifuge at approximately 4 to 5 percent total solids, and the centrifuge recovers approximately 50 percent of the solids, while producing a cake containing approximately 35 percent solids. The effluent from the centrifuge is returned to primary clarification. There has been no noticeable effect on the clarity of primary clarifier overflow or the chlorine demand for post chlorination of plant effluent.

A little over a year ago, a 40 x 60 in. centrifuge, specially designed for the handling of digested sludge, was installed at a plant, located just outside of Los Angeles, California. This plant treats an average of 214 mgd by primary sedimentation, followed by digestion and dewatering of the digested sludge.

With the rapid community expansion in the vicinity of the treatment plant, alternate methods of sludge dewatering had to be found, which led to the installation of a centrifuge for continuous large scale testing. The sludge is a combination of both domestic and industrial waste and of extremely poor settling and filtering characteristics. The data collected showed a recovery of suspended solids varies between 57% at 150 gpm to 71% at a 50 gpm feed rate. The sludge as fed to the centrifuge contains approximately 3% solids and the cake discharged from the centrifuge contains approximately 24% solids.

The District Engineers estimate that it would cost approximately $3.00 per ton to dewater the sludge at the 150 gfm feed rate. This cost includes power, maintenance, depreciation, operating labor and trucking the sludge from the centrifuges for air drying on the beds. The Districts are attempting to find methods of further concentrating the sludge fed to the centrifuge, and as power costs are practically independent of sludge concentration, the further concentration of the centrifuge feed would materially reduce the cost of dewatering the sludge.

### Water Pollution As Related to the Problem of Water Resources,

Mark D. Hollis, Asst. Surgeon General and Chief Engineer USPHS

We cannot continue to rely on traditional parameters as the only measures of the efficiency of wastewater treatment and the effect of treated and untreated wastes on water supply resources.

We need only remind ourselves that the current parameters of pollution: the 5-day BOD, bacterial indicator organisms, and the determination of natural organic and inorganic substances, even tastes and odor determinations, all were developed in the early stages of modern sanitary engineering. Prior to World War II they were reasonably satisfactory for the pollution situation of the times. They are still important to the concept of assimilation of pollution by dilution and to measure the self-purification phenomena of streams. But they can and do fall short—far short—of being effective measurements as reuse of water supplies becomes a dominant factor in the water resources picture and as the character of pollution changes.

And on this I am not speaking primarily of industrial sewers, but the changing character of metropolitan waste and the build up of chemical pollutants in run-off waters from agricultural and land-use practices.

Let's look for a moment beyond the concentration of substances which might be constituents of normal or traditional domestic and industrial wastes.

Since World War II we have seen research develop a whole new array of so-called exotic chemicals, mostly organic in nature. Chemicals which will kill insects, pests, and weeds—chemicals which replace soap as a detergent, chemicals which fertilize soils, chemicals which destroy bacteria and viruses in human beings. The end is nowhere in sight, research will produce more and more of these items and the public and industry will use them. Add to this the problem of radioactive wastes and then consider that with predictable increases in both production and use of all of these new chemicals, there will come new wastes, wastes about which we now know nothing.

We have seen the wide use of syndets resulting in an actual change in composition of domestic sewage and adverse effects on treatment processes. We know that some of these syndet components are not affected by present day treatment processes. Non-degraded residuals of syndets

therefore appear in water supplies where they may adversely affect current water treatment processes. This is but one chemical group about which we are only beginning to learn something.

Now is the time to ask: if synthetic detergents alone can have such effects as have been noted, what effects can combinations of syndets and other exotic chemicals have on the treatability, useability, and potability of our water resources, particularly in light of the coming problem of maximum reuse of water resources?

Perhaps our greatest single problem today is to close the gap of knowledge with respect to the behavior of these new contaminants in streams, their relationship to the factor of maximum stream reuse, their effects singularly or in combination on the ecology of the stream and on ground waters, and the effect on industrial and municipal water supplies.

THE NEXT TEN YEARS, Dr. Ralph E. Dwork, Director of Health, State of Ohio

We have seen during the last ten years a pace of construction of sewage and industrial waste treatment facilities in Ohio which is little short of phenomenal by comparison with the past.

The number of cities and villages in Ohio with municipal sewage treatment facilities has been considerably more than doubled. In the last ten years, actually less than ten years, Ohioans have purchased and erected more sewage treatment units than in the entire previous history of the state.

Industry has been moving right along with the municipalities. The number of industrial plants with satisfactory waste treatment facilities has been nearly tripled in the same period of time. Other industries have reduced their discharge of polluting wastes, although not yet to a satisfactory level. In actual figures, according to a recent tabulation of the Ohio Water Pollution Control Board, there are now 372 industries with satisfactory waste treatment, compared to 134 when the Board's permit program went into effect in 1952. There are currently 163 other industries which have taken some steps to reduce pollution but still have more to do.

There still are, for example, twenty-two cities without any sewage treatment, although a dozen of them have sewage plants under construction now and several of the others after long delay finally are working toward such construction. There are 81 villages which urgently need sewage plants. Less than a third of these have plants under construction.

There is the continuing problem of deterioration of existing municipal sewage plants. Too often these plants become woefully inadequate before steps are taken to renovate, repair and expand to meet new needs.

A few industries seem to be satisfied that they are conducting valuable research programs in behalf of water pollution control even though they have not yet installed anything to limit or control pollution. This may have been a good plea a few years ago, but it is rapidly losing merit. While it was reasonable to allow time to find the best methods of treatment, and

**Mark D. Hollis**
USPHS
Water Pollution and
Water Resources

**A. D. Caster**
Engineer in
Charge, Mill
Creek Works

while it is proper to give some consideration to economic recovery in waste treatment processes, our first goal is pollution control. We cannot wait for pollution control until it becomes a profit-making process.

In summary, I would say that the next ten years are going to see (1) a rapid, virtual crash program to complete the installation of waste treatment facilities in municipalities and industries needing such facilities; (2) a stepped-up program of improving and expanding existing facilities to meet growing needs; (3) a real campaign to eliminate inadequate sewer collection facilities; (4) a growing public demand for even better protection of waterways; (5) an educational campaign, to help the public have a better understanding of the overall problem.

CENTRIFUGES IN THE CONCENTRATION OF ACTIVATED SLUDGE, Frank E. Sullivan De Laval Separator Co., Poughkeepsie, N. Y.

The concentration and disposal of waste activated sludge has been a problem of major importance for many years. Many methods for concentration have been used, such as thickeners, pressure floatation tanks, continuous high-speed centrifuges, et al. In this paper, dealing with the use of the continuous centrifuge as a means for concentration of the activated waste sludge, we would like to report on centrifugal test conducted on the waste activated sludge withdrawn from a final settling tank. The principal object of these tests was to obtain a concentration of 5 to 5 percent solids in the sludge at the highest possible flow rate to the machine.

The centrifuge used for these tests was a high capacity nozzle type disc machine. The bowl operated at 4700 RPM. This type of unit contained 16 nozzles located at the periphery of the bowl wall for the continuous discharge of the concentrated sludge. Nozzle sizes up to 3.0 mm in diameter could be used in this centrifuge, however for these tests generally openings of 1.5 mm up to 2.0 mm were used. The clarified effluent was pumped away by a paring device located in the outlet chamber of the bowl and utilizing the rotational energy of the fluid for its pumping head.

The average solids content of the activated waste feed to the centrifuge was 1.2 percent (total dry solids by weight).

The concentrated centrifuged sludge contained between 4 to 6 percent solids with an average of 5 percent solids over the test period.

The clarified effluent varied between 2500 ppm up to 4000 ppm with solids variations apparently independent of the feed rates to the centrifuge. This represented a solids reduction based on the feed of 65 to 85 per cent.

Several samples of the centrifugally clarified activated effluents were tested in the laboratory to note any tendency to bulk when added back to the aeration tanks. Preliminary findings indicated that there would be no apparent detrimental effect when added back to the aeration section.

# *Dear Bill:* How do you keep young employees loyal and reasonably happy?

We've been reading for many years the demands, pleas and well reasoned requests for adequate salaries in our profession. I do not intend to discuss that problem again, although it is an important one. It is, however, tied in with another problem which our field shares with numerous other businesses today; the perplexing question of how to keep the young men we employ with us loyal and reasonably happy.

It seems to me that when we hire a young engineer or chemist or plant operator it's not only because we wanted him, and maybe this is more important, but because he wanted us. He is on the job because this is the work he wants to do. Since he has had formal training he is eager to put it to practical use. Training and eagerness and youth are not attributes to be wasted on minor and unimportant tasks; certainly they should not be completely spent in taking cars to the municipal garage or running out for the morning coffee.

I'll elaborate a little on this last thought. There is always plenty of routine work in any business and it has to be done, but no man wants to feel like a flunky. He has to have a sense of belonging and contributing to an organization. Give him only his share of the routine duties and show him that everyone has them. This can be done by explanation, but I've found the best way is by example. If a man sees that the boss has a share then he doesn't mind doing his part. Another item is to make sure a man knows that the routine is important. Our experience here is to show a man what can happen if it is not followed.

Now about those non-routine jobs that make a young man feel important. I'll cite one example and I imagine you can think of a dozen others. At one water treatment plant I know the chief operator had had a pet research project in mind for over five years but, with the demands of his job, he just never got it started. Finally he was able to hire a young chemist, when an expanded budget was approved (lucky man), and instead of keeping that project on the shelf for himself, he turned the chemist loose on it. The young chemist had his regular work to do but he was able to bring the research to a successful completion both to the plant's betterment and his own and, I might add, to the chief operator's great satisfaction.

Another pitfall in our use of the young talent we hire is that of finding something that the man can do well and then, because it's easy for him and for us, keeping him at it exclusively. In most cases that young man is going to be mighty tired of that job before long; even you wouldn't care for steak if you had to eat it seven nights a week for a month.

While I'm on this subject it would be well to mention another issue that is important to a young man. He is not going to know all the answers, he's not heard all the questions yet, but more than a few times I've found that it pays to listen to what a young man has to say. They are bright and quick and often have a fresh approach to a problem that will supply the right solution. Their learning may come in a large measure from text books but they may have been taught techniques that, with all our reading, we have overlooked. It gives a man added pleasure and interest in his work if he can look at some part of it and say "that's my baby, I thought of it and made it work".

Bill, my main theme is just this. Our field generally gives a man a living but it sure isn't going to make him wealthy. A man can make many friends in our work and even achieve some local fame as a good operator or engineer but national notoriety is hardly common, even among others of our profession. As I said earlier, a young man who seeks employment in water or sewage works planning or operation does so out of a desire to do that type of work. I realize that not all the job seekers we see are brilliant young idealists but we've all got to make a continuing and serious effort to keep and to fully utilize the talents of the men who want to enter our profession. We don't get so much good manpower that we can afford to waste it and I'd like to feel that fifteen or twenty years from now when I retire I've not only done a good job but that I've provided an able and satisfied replacement.

Yours,

*Bob*

Ed. Note: Bob is actually Robert Roth, San. Engr., Westchester County, N. Y.

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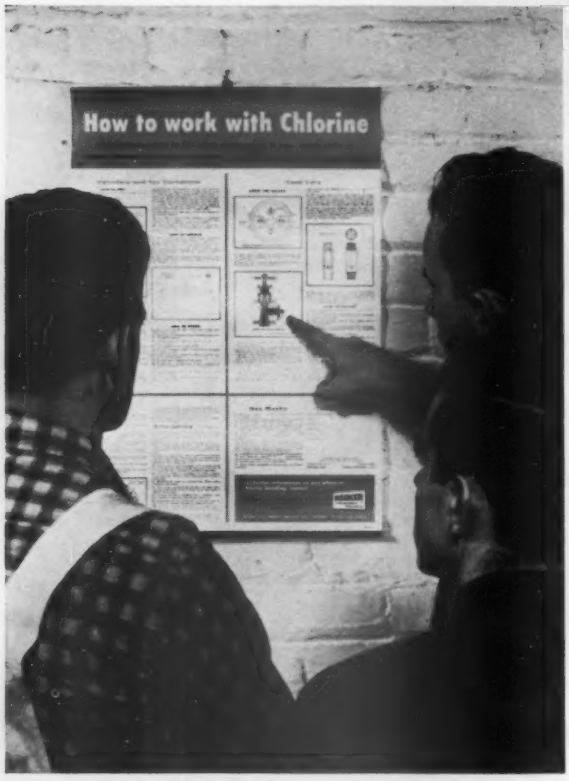


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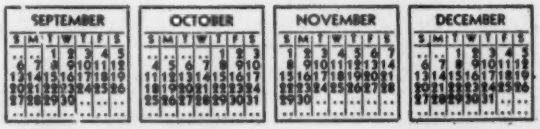
# Meetings

**1959**




Sept. 8-10—Moran, Wyoming (*Jackson Lake Lodge*)
ROCKY MOUNTAIN SECTION, A.W.W.A., Secy., V. A. Vaseen, 833 - 23rd St., Denver 2, Colo.
(Jointly With)
ROCKY MOUNTAIN SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Verne E. Plath, P. O. Box 149, Englewood, Colo.

Sept. 9-11—Milwaukee, Wis. (*Hotel Schroeder*)
WISCONSIN SECTION, A.W.W.A., Secy., Harry Breimeister, City Engrs. Office, City Hall, Milwaukee 2, Wis.

Sept. 9-11—Atlanta, Ga. (*Ga. Inst. of Tech.*)
GEORGIA WATER & SEWAGE ASSN., Secy., A. T. Storey, 1210 Hemphill Ave., N. W., Atlanta, Ga.

Sept. 9-11—Liverpool, Nova Scotia, Can. (*White Point Beach Lodge*)
MARITIME BRANCH, CANADIAN SECTION, A.W.W.A., Secy., J. D. Kline, Public Service Commission, P. O. Box 608, Halifax, N. S.

Sept. 13-18—Atlantic City, N. J.
136TH NATIONAL MEETING AMERICAN CHEMICAL SOCIETY, Secy., H. B. Gustafson, P. O. Box 5033, Tucson, Ariz.

Sept. 14-16—Lexington, Ky. (*Lafayette Hotel*)
KENTUCKY-TENNESSEE SECTION, A.W.W.A., Secy.. J. Wiley Finney, Jr., Howard K. Bell, Cons. Engrs., 553 South Limestone St., Lexington, Ky.
(Jointly With)
KENTUCKY-TENNESSEE INDUSTRIAL WASTES & SEWAGE WORKS ASSN., Secy., S. Leary Jones, Cordell Hull Bldg., Nashville, Tenn.

Sept. 16-18—Minneapolis, Minn. (*Pick-Nicollet Hotel*)
NORTH CENTRAL SECTION, A.W.W.A., Secy., L. N. Thompson, Gen. Mgr., Water Dept., St. Paul 2, Minn.

Sept. 16-18—Upper Saranac Lake, N. Y. (*Saranac Inn*)
NEW YORK SECTION, A.W.W.A., Secy., Kimball Blanchard, 19 W. 50th Street, New York 20, N. Y.

Sept. 20-23—Lake Placid, N. Y. (*Lake Placid Club*)
NEW ENGLAND WATER WORKS ASSN., Secy., Joseph C. Knox, N.E.W.W.A., 73 Tremont St., Boston 8, Mass.

Sept. 23-25—Grand Forks, No. Dak. (*Dacotah Hotel*)
DAKOTA WATER & SEWAGE WORKS CONF., Secy., W. Van Heuvelen, c/o State Dept. of Health, Bismarck, N. Dak.

Sept. 23-25—Saginaw, Mich. (*Bancroft Hotel*)
MICHIGAN SECTION, A.W.W.A., Secy., T. L. Vander Velde, State Dept. of Health, DeWitt Road, Lansing 4, Mich.

CONTINUED ON PAGE 96A

# Coordinating "Umpteen" different suppliers

## ...is costly to you and your consultants

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A multitude of suppliers, each with a product for your project, means endless conference hours coordinating equipment designs, delivery schedules, erection services. It means many extra phone calls, telegrams, voluminous correspondence!

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*Cut out all the waste of time, effort and money* involved in coordinating a multitude of suppliers by contacting your A-C representative—or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

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### Horizontal sewage ejectors designed for long service under heaviest loads

You can depend on Weinman Type U-B pumps. They won't clog . . . easily handle liquids carrying large solids, stringy or fibrous trash and material suspended in sludge form.

Compact and simple in design, yet sturdily built for dependable service, Weinman sewage ejectors out-perform other horizontal units. Type U-B non-clog pumps are equipped for either belt drive or motor drive. Enclosed non-clog type impeller is designed to produce steep head-capacity curve. Cast iron regularly furnished, bronze or stainless steel impellers available also.

For full information about Weinman sewage ejectors or other centrifugal pumps, see your Weinman pump specialist. He is listed in the Yellow Pages. Or, write us direct for Bulletin No. 1500 describing Type U-B horizontal non-clog pumps.

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Sept. 27-29—Kansas City, Mo. *(Hotel President)*
MISSOURI SECTION, A.W.W.A., Secy., Warren A. Kramer, Div. of Health, State Office Bldg., Jefferson City, Mo.

Sept. 27-30—St. Paul, Minn. (*St. Paul Hotel*)
AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Secy., F. J. Van Antwerpen, 25 W. 45th St., New York 36, N. Y.

Sept. 28-30—Toronto, Can. (*Royal York Hotel*)
CANADIAN INSTITUTE ON SEWAGE AND SANITATION, Secy., Dr. A. E. Berry, 72 Grenville St., Toronto, Ontario, Can.

Oct. 7-9—Baltimore, Md. (*Sheraton Belvedere Hotel*)
CHESAPEAKE SECTION, A.W.W.A., Secy., Carl J. Lauter, 6955-33rd St., N.W., Washington 15, D. C.

Oct. 8—Kingfield, Me.
MAINE WATER UTILITIES ASSN., Secy., G. F. Laurin, 89 Western Ave., Augusta, Maine

Oct. 8-9—Pocatello, Idaho
INTERMOUNTAIN SECTION, A.W.W.A., Secy., W. C. Hague, Chief Engr., Metropolitan Water Dist., 703 Tribune Bldg., Salt Lake City, Utah

Oct. 10—Kenosha, Wis.
CONF. OF WISCONSIN SEWAGE WORKS OPERATORS, Secy., Clarence W. Bogenhagen, 313 Fifteenth St., Fond du Lac, Wis.

Oct. 12-15—Dallas, Texas (*Statler Hilton Hotel*)
FEDERATION OF SEWAGE & INDUSTRIAL WASTES ASSN., Exec. Secy., Ralph E. Fuhrman, 4435 Wisconsin Ave., N.W., Washington 16, D. C.

Oct. 14-16—Des Moines, Ia. (*Hotel Fort Des Moines*)
IOWA SECTION, A.W.W.A., Secy., J. J. Hail, Supt., Water Dept., City Hall, Dubuque, Iowa

Oct. 18-21—New Orleans, La. (*Roosevelt Hotel*)
SOUTHWEST SECTION, A.W.W.A., Secy., Leslie A. Jackson, Municipal Water Works, Robinson Memorial Auditorium, Little Rock, Ark.
(Jointly With)
ALA.-MISS. SECTION, A.W.W.A., Secy., Ernest Bryan, McWane Cast Iron Pipe Co., Box 2601, Birmingham, Ala.

Oct. 19-23—Washington, D. C. (*Hotel Statler*)
AMERICAN SOCIETY OF CIVIL ENGINEERS, Annual Convention, Exec. Secy., W. H. Wisely, 33 W. 39th Street, New York 18, N. Y.

Oct. 21-22—Providence, R. I. (*Biltmore Hotel*)
NEW ENGLAND SEWAGE & IND. WASTES ASSN., Secy., Earl R. Howard, Bur. of Public Works, 115 Broad St., Hartford, Conn.

Oct. 22-24—Atlantic City, N. J. *(Hotel Madison)*
NEW JERSEY SECTION, A.W.W.A., Fall Meeting, Secy., Albert F. Pleibel, 683 Prospect St., Maplewood, N. J.

Oct. 26-28—Pittsburgh, Pa. (*Penn Sheraton Hotel*)
20TH ANNUAL WATER CONFERENCE, ENGINEERS' SOCIETY OF WESTERN PENNA., Secy., W. M. Porter, Society Office, Penn Sheraton Hotel, Pittsburgh 30, Pa.

Oct. 26-30—Allerton Park, Ill. (*Univ. of Illinois*)
8TH ANNUAL ILLINOIS WATER WORKS MANAGEMENT SHORT COURSE, Director, Dr. T. E. Larson, State Water Survey Div., Urbana, Ill.

CONTINUED ON PAGE 98A

*Allis-Chalmers introduces...*

# New vertical turbine pump—the prime pump that needs no priming

Now Allis-Chalmers brings its 85 years of pump experience to the short-coupled vertical turbine-type field. This addition not only rounds out industry's most complete single source for pump installations, it offers many advantages wherever liquids are to be pumped. Standard sizes for heads up to 400 ft or more, and capacities ranging from 20 to 8000 gpm.

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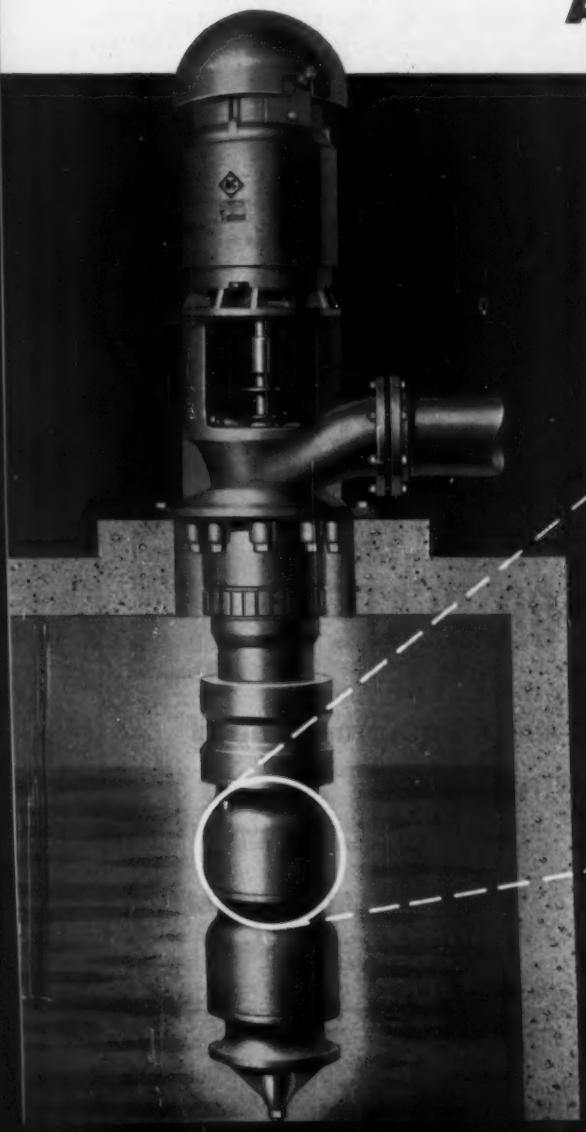
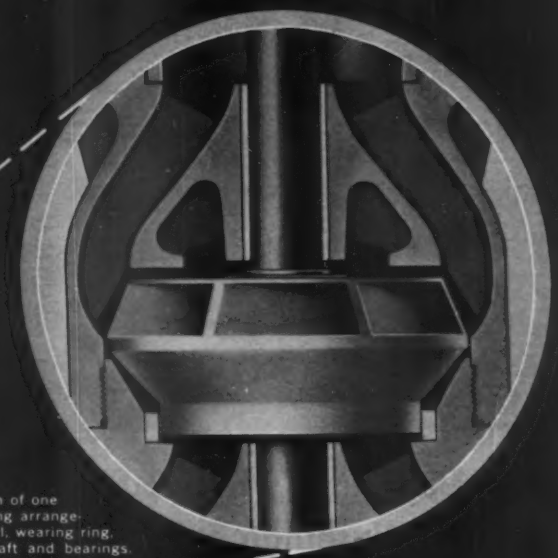


**Many advantages** — Self-priming • eliminate suction piping costs • save space, motor support and discharge nozzle are integral • low first cost • increase pressure easily • operate quietly • low maintenance with one stuffing box • no motor flooding.



Cross-section of one stage showing arrangement of bowl, wearing ring, impeller, shaft and bearings.

**Many applications** — Water systems, irrigation, condenser systems, bilge and sump service, dry docks, fire equipment, filter washing, recirculation, transfer pumping, process pumping, cooling condensers and diesel engine jackets, air conditioning, caisson and mine dewatering, general-purpose pumping.

Oct. 28—New York, N. Y. *(Biltmore Hotel)*
ASSN. OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS

Oct. 28-29—Providence, R. I. *(Biltmore Hotel)*
NEW ENGLAND SEWAGE & INDUSTRIAL WASTES ASSN., Annual Meeting, Secy., Earl R. Howard, Bur. of Pub. Works, 115 Broad St., Hartford, Conn.

Oct. 28-29—Parkersburg, W. Va. *(Chancellor Hotel)*
WEST VIRGINIA SECTION, A.W.W.A., Secy., Hugh W. Hetzer, Engr., Union Carbide Chemical Co., Box 8361, South Charleston 3, W. Va.
(Jointly With)
WEST VIRGINIA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., G. O. Fortney, c/o State Dept. of Health, Charleston 5, W. Va.

Oct. 28-30—Dayton, Ohio *(Biltmore Hotel)*
OHIO SECTION, A.W.W.A., Secy., Howard Bass, Robt. F. McGivern & Assocs., 1771 West Fifth Ave., Columbus 12, Ohio

Oct. 29-31—Coos Bay, Oregon *(Tioga Hotel)*
PACIFIC NORTHWEST SEWAGE & INDUSTRIAL WASTES ASSN., Secy., G. H. Dunstan, Box 176, Pullman, Wash.

Oct. 30—Bakersfield, Calif. *(Hacienda Hotel)*
CALIFORNIA SECTION, A.W.W.A. (Business Meeting), Secy., Roy E. Dodson Jr., Supt. of Production, San Diego Water Dept., Balboa Park, San Diego, Calif.

Nov. 4-6—Roanoke, Va. *(Hotel Roanoke)*
VIRGINIA SECTION, A.W.W.A., Secy., E. H. Ruehl, R. Stuart Royer & Assocs., 15 W. Cary St., Richmond, Va.

Nov. 5-6—Sidney, Nebr. *(Sidney Motor Hotel)*
NEBRASKA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., V. J. Lechtenberg, 2549 Farnam St., Omaha 31, Nebr.

Nov. 9-11—Durham, N. C. *(Washington Duke Hotel)*
NORTH CAROLINA SECTION, A.W.W.A., Secy., D. Y. Brannock, Supt., Water & Sewage Plants, Burlington, N. C.

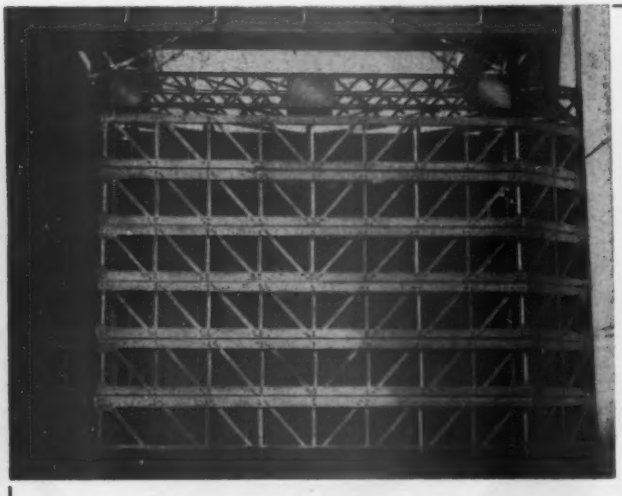
Nov. 10-13—Atlantic City, N. J. *(Chalfonte Hotel)*
PENNSYLVANIA WATER WORKS ASSN., Secy., Harry A. DeWire, 29 Chestnut Street, Lewistown, Pa.

Nov. 15-19—Tampa, Fla. *(Hillsboro Hotel)*
FLORIDA SECTION, A.W.W.A., Secy., J. G. Simmons, Plant Supt., West Palm Beach Water Dept., Box 1311, West Palm Beach, Fla.
(Jointly With)
FLA. SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Ralph H. Baker, Jr., State Bd. of Health, P. O. Box 210, Jacksonville 1, Fla.

Nov. 16-20—Stillwater, Okla. *(Okla. State University)*
OKLA. WATER, SEWAGE & INDUSTRIAL WASTES ASSN. 33RD ANNUAL MEETING, Secy., H. M. Crane, Okla. State Dept. of Health, 3400 North Eastern, Oklahoma City, Okla.

Nov. 18-19—Indianapolis, Ind. *(Washington Hotel)*
INDIANA SEWAGE & INDUSTRIAL WASTES ASSN., Secy., Frank D. Wraight, Dept. of Health, 1330 W. Michigan St., Indianapolis 7, Ind.

Nov. 19—Boston, Mass.
NEW ENGLAND WATER WORKS ASSN., Secy., Joseph C. Knox, 73 Tremont St., Boston, Mass.

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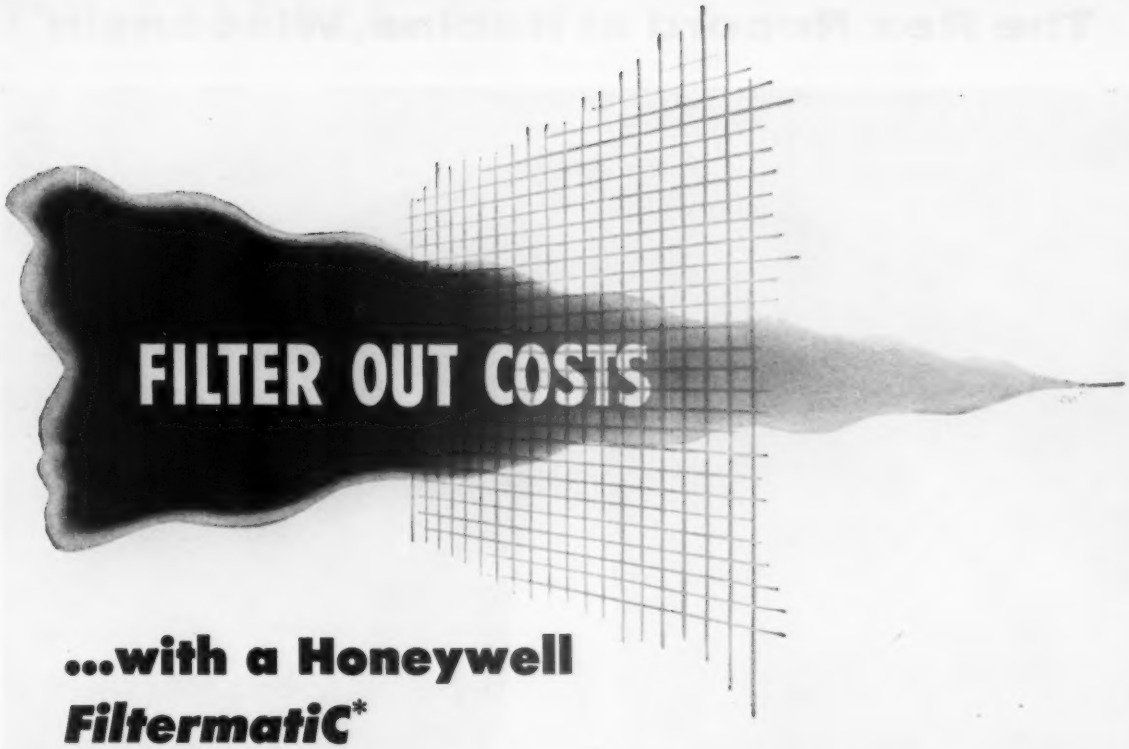


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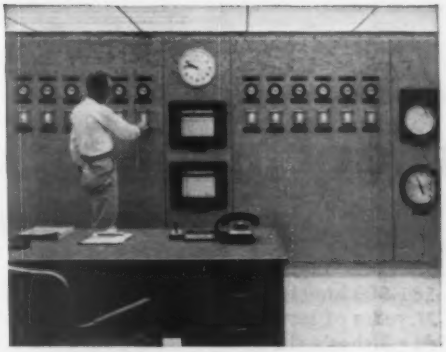
You'll save in purchasing, operating costs, installation and maintenance with a Honeywell *FiltermatiC* control system. It's a complete, automatic control system, engineered with *standard* products for your specific water filtration requirements.

*FiltermatiC* control systems are designed to operate an entire plant *of any capacity* from a single central control panel—or from individual consoles for each filter. Components are compact, require surprisingly little space in pipe gallery and on operating floor. Installation is easy, whether you're modernizing your plant or building a new one.

Honeywell service is an important *plus* that protects your instrumentation investment. It begins when first you decide you need instruments, and continues long after they're installed. It includes preliminary engineering . . . assistance in preparing specifications . . . application engineering for installation and start-up . . . periodic service . . . swift help in emergencies . . . and many extras.

*Minneapolis-Honeywell Trademark



Enjoy the economy and assurance of buying instrumentation from a single, reliable source —the world's largest manufacturer of controls. Your nearby Honeywell field engineer can give you complete facts and figures. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

**Honeywell**

H HONEYWELL *First in Control*

# The Rex Record at Racine, Wisconsin

Rex Primary Sludge Collectors at the Racine, Wis., sewage disposal plant. Rex Equipment at this plant includes longitudinal and cross collectors . . . grit collectors and washer . . . bar screen and triturator.

## 181,800 hours of continuous operation... with original equipment

181,800 hours of continuous operation...almost 21 years of service 365 days a year, 24 hours a day...that's the record Rex Conveyor Sludge Collectors have established at the Racine, Wisconsin, sewage treatment plant. Here's definite proof of the design and manufacturing superiority of Rex Equipment. Rex Z-Metal Chains, Temperim sprockets, case-hardened centralized wearing shoes, accurately made redwood flights and self-aligning underwater bearings, plus balanced strength, flexible design and the other Rex "extras," put extra life into Racine's Rex Conveyor Sludge Collectors...both longitudinal and cross collectors.

If you're interested in record service like Racine's why not investigate Rex Waste Treatment Equipment. In the broad Rex line, there's exactly the right choice for you...from screening to clarification. For all the facts, write CHAIN Belt Company, 4610 West Greenfield Avenue, Milwaukee 1, Wisconsin.

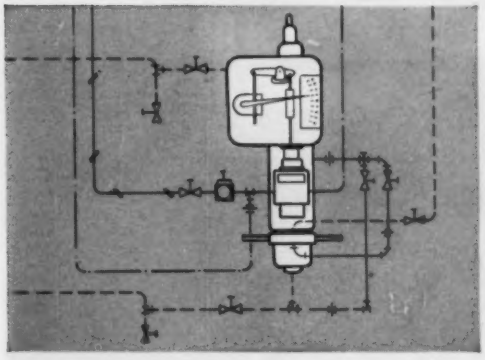
Thomas T. Hay, superintendent of Racine Sewage Treatment Plant since 1941. His careful operation and maintenance practices have been a major factor in this record performance. Consulting Engineers: Alvord, Burdick & Howson, Chicago, Illinois.

REX®

CHAIN BELT COMPANY

# FLUIDICS

**is a Pfaudler Permutit program providing a modern, imaginative approach — plus the specialized materials and equipment — for handling and processing and controlling more profitably the liquids and gases which are the lifeblood of our manufacturing economy.**



FLUIDICS AT WORK

## New pneumatic transmission system more accurate, more dependable

The diagram shows a typical setup for the new Simplex system for transmitting rate of flow and loss of head to a receiver.

### Rate of Flow

The new Type PN transmitter combines the exceptional accuracy and range of a differential converter operated by a mercury float with the traditional dependability of pneumatic transmission.

The transmitter consists of a differential converter which extracts the square root flow function from a primary and then positions a pneumatic motion transmitter. The transmitter produces a pneumatic 3 to 15 psig linear signal. A booster pitot diaphragm in the motion transmitter insures a low lag coefficient and fast transmission.

Besides getting a linear signal without using supplementary pneumatic relays, this new unit gives you point accuracy over wide ranges of flow with minimum differentials. The booster permits accurate transmission over long distances with minimum lag.

### Loss of Head

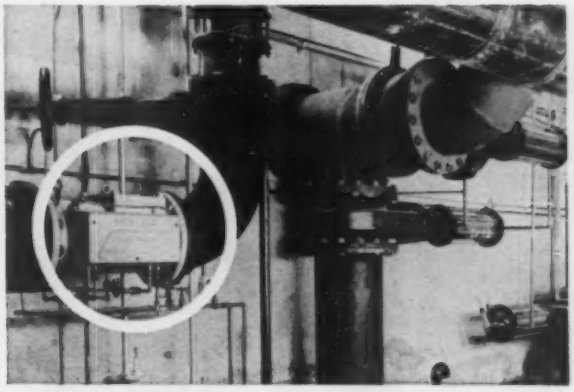
A Type TD transmitter gives accurate readings to within ±1%. It uses no stuffing boxes or relay valves, so both installation and maintenance are simple and economical.

Connected to Simplex Pneumatic Gauges, this new system should give long years of accurate, dependable, trouble-free service.

**SIMPLEX®**

**a division of PFAUDLER PERMUTIT INC.**

**Specialists in FLUIDICS . . . the science of fluid processes**



FLUIDICS AT WORK

## Modulair Flow Controller installs as easily as a piece of pipe

So simple is this new pneumatic rate-of-flow controller, you can install it in about the time it takes to install a piece of pipe.

The differential producer and the modulator lie in a single housing. The actuator is entirely enclosed in a case which mounts directly on the housing.

**Result:** No complicated piping or drain system to install and maintain.

For a bulletin giving complete specs and performance data, write to our Simplex Division, Lancaster, Pennsylvania. Ask for Bulletin 951.

**Fast, dependable delivery insured by new plant**

This is the new $2,000,000 home of our Simplex Division . . . an ultra-modern plant designed from front to back to give you fast, dependable service on valves and meters. New manufacturing techniques, updated assembly lines and ample manufacturing capacity and a complete staff of skilled workers have all been planned around the single objective of getting your orders to you on time and built to your exact specifications.

# GASLIFTER UNIT

## DIGESTER CIRCULATOR-MIXER

**INCREASED CAPACITY—GASLIFTER** circulated digesters easily handle loadings of 6 lbs. of solids/cu. ft./mo.

**BETTER DIGESTION**—15 to 20% more gas (methane) per lb. of volatile solids, together with low and uniform volatile acids—all accomplished in single stage digestion at high loading rates.

**ELIMINATES SCUM BLANKETS AND GRIT SHOALS**—Rapid circulation along roof, walls and bottom disperses grease blanket and prevents loss of capacity due to grit shoaling.

**ADAPTABLE TO STANDARD OR HIGH RATE DIGESTION**—The GASLIFTER may be applied to either standard or high rate digesters with equally efficient results.

**ACCESSIBLE**—SPECIALLY DESIGNED LOCKING CHAMBER permits individual inspection and service of stainless GASLIFTER sparging units without dangerous gas loss or digester shutdown.

**NO MECHANICAL SHUTDOWNS—GASLIFTER** utilizes gas-lift principle and completely avoids mechanical troubles from rag and sewage "string" fouling. Sparjers used to diffuse gas in the eductor tube avoid all orifice troubles.

GASLIFTERS incorporate the patent rights of Joseph Cunetta

Above—Installation at Aurora Sanitary District, Aurora, Illinois serves to illustrate circulation and mixing action achieved with GASLIFTER. Published operating data attests to the resulting increased efficiency.

Walter A. Sperry
Supt., Aurora Sanitary District
Walter E. Deuchler Co., Aurora
Consulting Engineers

Engineers will be interested in Bulletin 25-S-91 for details on GASLIFTERS: and Brochure 25-S-11336 for complete report on GASLIFTER operating results at a full scale plant installation. *Write for your copies.*

GASLIFTER is a trademark of Walker Process Equipment Inc.

WALKER PROCESS

WALKER PROCESS EQUIPMENT INC.
FACTORY • ENGINEERING OFFICES • LABORATORIES
AURORA, ILLINOIS

# NEW F&P RESIDUAL CHLORINE ANALYZER

## *stays* accurate with *Micro-Ball*® self-cleaning action

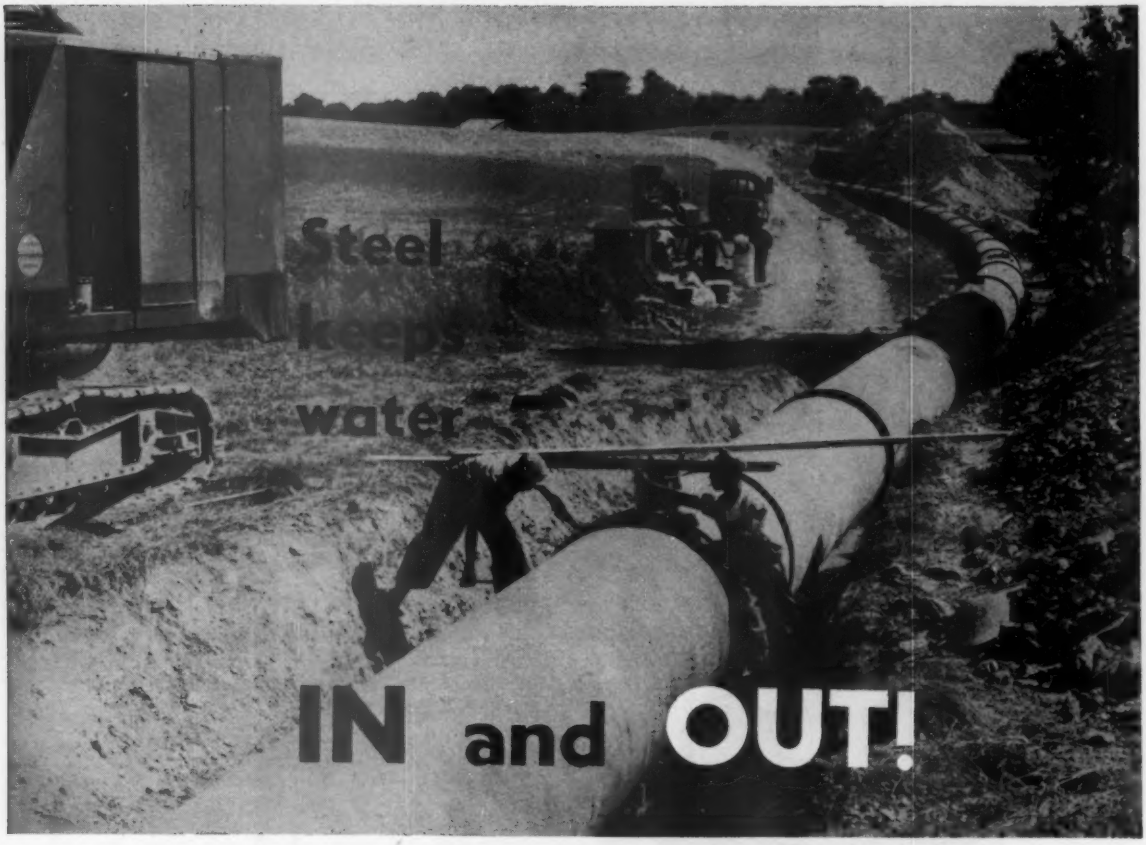
*Continuous* accuracy . . . *continuous* sampling of chlorine residual . . . you get both with F&P Depolox* Amperometric Analyzer. Electrodes are kept electrically stable by F&P's exclusive Micro-Ball self-cleaning cell design. The resulting long-term dependability is a matter of record in hundreds of applications.

Micro-Ball self-cleaning is as simple as it is dependable. A number of tiny glass balls are continuously circulated between the concentric electrodes of the sampling cell. Polishing action of the whirling Micro-Balls keeps the electrodes clean . . . assures long electrode life and continuous accuracy. The Micro-Balls are retained permanently in the sampling cell. No abrasive grit is ever necessary. And there's never any danger of clogging. All these features make Depolox ideal for completely automatic closed-loop chlorination systems.

Get all the facts you need on Depolox Residual Chlorine Analyzer by contacting the F&P field engineer nearest you, or write Fischer & Porter Company, 199 Fischer Rd., Hatboro, Pa. In Canada, write Fischer & Porter (Canada) Ltd., 2700 Jane Street, Downsview, Ontario.

**Licensed by CHLORATOR . . . Pat. Pending*

**FP FISCHER & PORTER COMPANY** INSTRUMENTATION AND CHLORINATION




Whether it's running through soft ground, or taking a pounding under city streets, steel pipe delivers *all* the water all the time. No "unaccounted-for-water" losses . . . and just as important, no contamination by ground water infiltration into the line.

No other material provides such ease of installation. Fabricated to order in extra long lengths, steel pipe is easy to haul, easy to handle, and easy to join.

Leak-proof, flexible couplings enable the pipe to follow the contours of the terrain . . . take long curves, rise and drop with natural slopes, and remain tight despite washouts, cave-ins.

Installation costs of steel pipe water lines are low because of the fewer pipe lengths required, and because of the ease and speed of installation. Particularly in the tough spots . . . hanging suspended over chasms, tunneling through mud, clay or quicksand, taking the pressures generated as the line runs down a mountain . . . it's always best to pipe water with steel . . . it's often the only way.

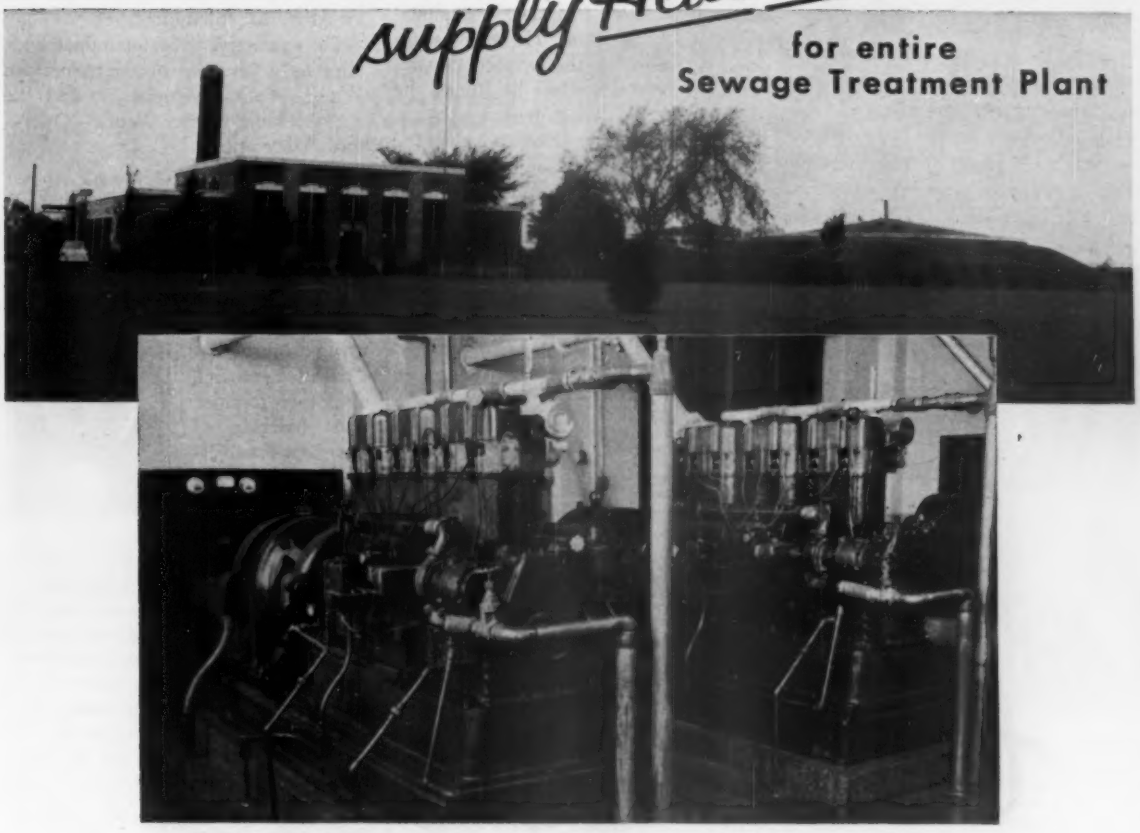
***Steel fabricated pipe saves money. Specify steel with confidence!***

STEEL PLATE FABRICATORS ASSOCIATION

105 West Madison Street
Chicago 2, Illinois

# TWO ROILINE ENGINES supply Heat and Power for entire Sewage Treatment Plant

(Formerly LE ROI)



City of Oshkosh, Wis., sewage treatment plant powered by two Model F-1500 Roiline Engines—1503 cu. in. displ., 6¾-in. bore x 7-in. stroke, counterbalanced crankshaft—each 215 max. hp at 1200 rpm.

Operating continuously, but alternately . . . one engine working, the other standing by . . . two F-1500 ROILINES, driving 50 KW generators, supply heat and power for this entire sewage treatment plant, including the digestors. It is not unusual for ROILINES in service like this to run 30,000 hours or more without major overhaul.

Not only dependable power but low up-keep and long service life is built into ROILINE Engines. With a close-to-perfection combustion chamber that gives you more horsepower per fuel dollar. With full length guided valve stem mechanisms, light weight cam ground aluminum pistons, precision bearings, full flow oil filters, sectional water-cooled exhaust manifolds, large main bearings, full pressure lubrication, and other big features.

*For details, send for Bulletin E-9.*

**ARIZONA, Casa Grande,** Engine Service Company, Inc.
**ARKANSAS, Paragould,** Wonder State Manufacturing Co.
**CALIFORNIA, Long Beach,** Engine & Equipment Company
**COLORADO, Denver,** Emrick & Hill Engine & Equipt. Co.
**ILLINOIS, Centralia,** John Nickell Company
**KANSAS, Garden City,** Carson Machine & Supply Co.
**LOUISIANA, New Orleans,** Southern Engine & Pump Co.
**MICHIGAN, Reed City,** Hafer Engine Company
**OHIO, Columbus 19,** Cantwell Machinery Company
**OKLAHOMA, Chickasha,** Chickasha Gin & Mill Supplies
**Oklahoma City 9,** Carson Machine & Supply Co.
**PENNSYLVANIA, Pittsburgh 34,** P. C. McKenzie Company
**TEXAS, Houston 1,** Southern Engine & Pump Co. (also in Beaumont, Corpus Christi, Dallas, Edinburg, Kilgore, San Antonio)
**Lubbock,** Farmers Supply Company
**Odessa,** General Machine & Supply, Inc.
**Wichita Falls,** Nortex Engine & Equipment Co.
**WYOMING, Casper,** Emrick & Hill Engine & Equipt. Co.

409-R

*• The trade mark LE ROI is used under license from Westinghouse Air Brake Co., the trade mark owner.*

**WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN** / **New York • Tulsa • Los Angeles**
**Factories: Waukesha, Wisconsin and Clinton, Iowa**

# News of Suppliers

## Wheelin and Gumaer of Neptune Die

James L. Wheelin, sales representative of Neptune Meter Company, New York, died at the Hospital for Special Surgery in New York in July. He was 59 years old.

He was active in the water industry, and well known throughout the sales territory he covered, which included Long Island and the counties of Westchester, Putnam and Richmond.

Mr. Wheelin was with the Thomson Meter Company when it was purchased by Neptune. He was assistant manager of the service department until 1959, when he joined the Neptune sales department.

Ralph Gumaer, vice president of Philadelphia Meter Company, a Neptune Meter Company subsidiary, died in July at Lankenau Hospital in Overbrook, Pa. He would have been 63 on Aug. 28 of this year.

Mr. Gumaer joined the organization in 1930 and assumed the duties of Manager of the company's Philadelphia office. He was previously employed by the Mueller Company, a Decatur, Ill. manufacturer.

He was active in water industry affairs as a member of the American Water Works Association, and the Pennsylvania Water Works Operators Association.

ALGAE-FREE WATER
MEANS
Copper Sulfate
treated water
Not only is Triangle Brand Copper Sulfate successful in controlling algae but it also is effective in killing some aquatic weeds. Since the weeds are submerged and disintegrated, there is no chance of them floating down stream to start new infestations, or to clog the waterway.
In sewage systems, Triangle Brand Copper Sulfate prevents roots and fungus from clogging pipes. However, there is no danger of affecting the surface trees owing to the low concentration of copper sulfate necessary to be valuable.
The new booklets "The Use of Copper Sulfate in The Control of Microscopic Organisms" and "Copper Sulfate for Root and Fungus Control in Sanitary Sewers and Storm Drains" will keep you up to date. Send for a copy today! Phelps Dodge Refining Corp., 300 Park Ave., New York 22, N. Y.
PHELPS DODGE REFINING CORP.
NICHOLS
CHEMICALS


## Charles Yeomans, Co-Founder Yeomans Bros. Dies

Yeomans Brothers Co., Melrose Park, Illinois has announced that Charles Yeomans, age 81, co-founder and chairman of the board of directors of the company died July 28, in La Jolla, California, after a year's illness.

Mr. Yeomans came to Chicago to join his brother Edward in founding the 61-year-old pumping and sewage treatment equipment firm immediately following his graduation from Princeton University. Operating first as manufacturers' representatives, the Yeomans brothers started building pumps to their own designs in job shops in 1900. In 1904, they opened their own factory. The company's move to the present factory site was the fourth in the steady growth of the firm.

Charles Yeomans succeeded his brother as president of Yeomans Brothers company in 1923, acting in this capacity until he was elected as chairman of the board in 1952.

## Dorr-Oliver Opens Florida Office

Dorr-Oliver, Inc., Stamford, Conn., has announced the opening of a new sanitary sales office in Winter Park, Florida. Centrally situated, this new office will enable the company to provide better service for consulting engineers in Florida and the southern counties of Georgia. The new D-O Winter Park address is 203 KnoWel Building, Knowles at Welbourne.

W. B. Williams, named Manager

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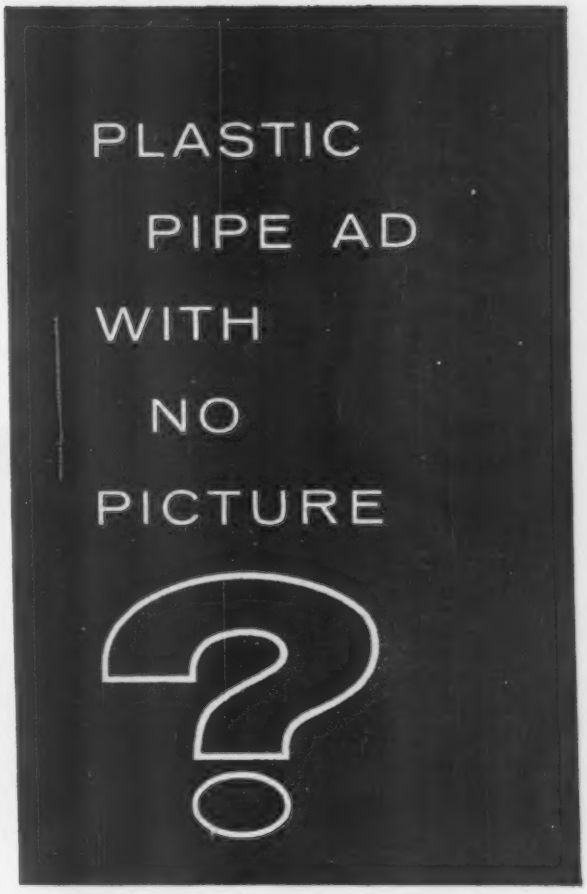



# *why no picture?*

***A picture can be deceiving. Almost all plastic pipe looks the same . . . and even looks like metal pipe. The difference is a matter of time . . . and piping that goes wrong can be mighty expensive for a water works manager. A picture means nothing . . . but . . .***

There are scores of brands of plastic pipe on the market . . . made of a dozen different materials . . . wonderfully improved over the early plastics. All are labeled "rust resistant" . . . but total results may be good, bad, or indifferent depending on your choice. Here's what to look for:

**The universal material?** No such thing. No one plastic (no *metal*, for that matter) can handle *all* liquids . . . no one has all the properties required of a truly universal pipe. Closest to it are Ace Riviclor (Rigid PVC) and Ace-Ite (ABS rubber-plastic blend). Riviclor is a little better on chemical resistance, and Ace-Ite is a little better on impact strength and heat resistance. Both are OK for drinking water and also for chemicals used in treating water. Of course they're immune to rust, rot, soil and electrolytic corrosion. And they both cost about the same.

**Are plastics fully approved for drinking water?** Yes . . . the National Sanitation Foundation at University of Michigan attest with their seal that they regularly test Ace Riviclor, Ace-Ite, Ace Supplex and certain of our other brands of plastic pipe, and certify them non-toxic. These materials are odorless and tasteless as well as non-toxic.

**Are plastics strong enough?** Hundreds of water works and thousands of chemical plants (all very critical people) say *yes!* Plastic pipe is now available in several wall thicknesses for working pressures to 490 psi. It takes plenty of hard knocks, and resists accidental cutting and damage quite satisfactorily.

**Where do I use it?** Ace-Ite and Riviclor have been used with wide success for years in water and sewage works for feeding a host of treatment and regenerating chemicals . . . chlorine, alum, ferrous sulfate, ferric chloride, etc. They outlast ordinary metals many times over, at prices much lower than special metals.

Greatest future use is in service lines and small water mains, now under extensive study. We've supplied miles of pipe for successful installations. If you haven't yet put some underground for test, it's time to start. Nothing takes the place of *personal* experience. (Also, try Ace Supplex flexible polyethylene for temporary lines.)

**How can I dodge the pitfalls of "trial and error?"** Go to a company that has no axe to grind . . . a company with the widest experience in water works problems. We, for instance, supply seven different kinds of pipe for water and sewage works . . . with fittings and valves to match. And we've always supplied the industry with a high percentage of the precision hard rubber water meter parts, rubber-lined ion-exchange tanks, molded chlorinator parts, rubber-lined intake lines, and chemical pumps now in use. For truly unbiased advice . . . backed by 100 years of experience . . . and prices as low as you'll find anywhere . . . come to American Hard Rubber Company.

**Free Selector Charts.** 20 valuable pages . . . comparable properties, chemical resistance, costs, etc., of 11 plastics and rubber materials. **Write today for Technical Bulletin CE-50W.**

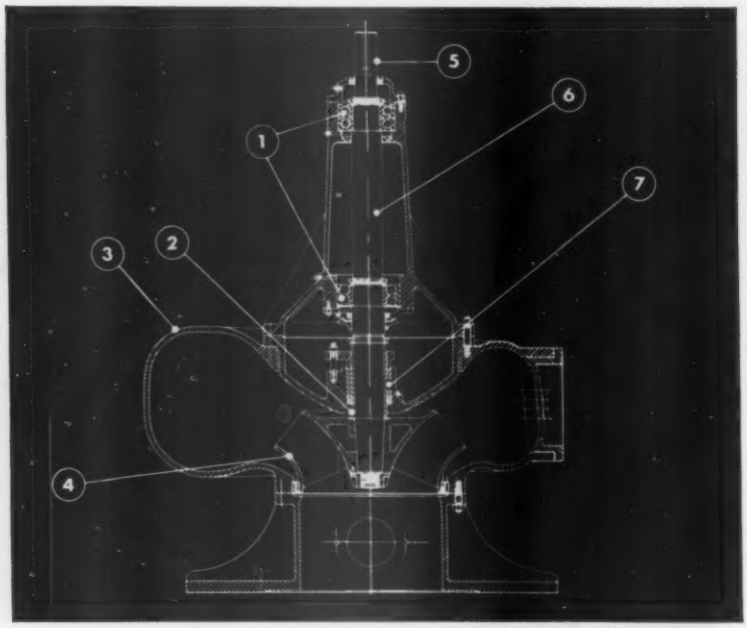
Ace-Ite®, Ace Riviclor® and Ace Supplex® are approved for drinking water.

**ACE RUBBER & PLASTICS EQUIPMENT**
**BY AMERICAN HARD RUBBER COMPANY**
**DIVISION OF AMERACE CORPORATION**
**ACE ROAD • BUTLER, N. J.**

# News of Suppliers

CONTINUED FROM PAGE 106A

of the Winter Park office, has been transferred from Southeastern headquarters at Atlanta from where he has handled D-O sanitary sales in the new office area since joining the company in 1956. Mr. Williams is a civil engineering graduate of Georgia Institute of Technology and a veteran of Merchant Marine and Air Force service during World War II. He served as a water pollution control engineer in Atlanta, Ga. from 1949 to 1956. A member of the Georgia and Florida Water and Sewage Association, he belongs to the National Society of Professional Engineers, Georgia Engineering Society, the American Water Works Association, and the Georgia Sewage & Industrial Wastes Association.


**Which features are biggest down-time savers in big sewage pumping jobs?**

Wheeler-Economy says these features of its Mixed Flow Volute Pumps will be on anyone's list. See if you don't agree.

1. BALL AND ROLLER BEARINGS with heavy-duty thrust bearing located atop bearing bracket.

2. EASILY-ACCESSIBLE ROTOR reduces down-time for maintenance.

3. HIGH-STRENGTH CASING is close-grained cast iron. Steel or special alloys furnished to meet special conditions.

4. IMPELLER is bronze, cast iron or alloy suitable for the service. Wearing Rings are easily renewable.

5. FLEXIBLE COUPLING is located between the Pump and the Motor.

6. HEAT-TREATED ALLOY STEEL SHAFT is extra large for added strength and is precision ground and polished.

7. STUFFING BOX is unusually deep to hold adequate packing and is easily accessible for replacing packing. It can be fitted with cage or lantern ring for flushing when pumping gritty liquids.

8. VERTICAL OR HORIZONTAL mounting can be furnished.

Write for Catalog F-102, for complete information on sewage pumps with 3000-150,000 gpm. capacities

*Economy Pump Division*

**C. H. WHEELER MFG. CO.**

19th and Lehigh Avenue • Philadelphia 32, Pa.

*Whenever you see the name C. H. Wheeler on a product, you know it's a quality product*

Centrifugal, Axial and Mixed Flow Pumps • Steam Condensers • Steam Jet Vacuum Equipment • Marine Auxiliary Machinery • Nuclear Components


## Wetjen Names V.P. of Buffalo Meter

Buffalo Meter Company, Buffalo, N. Y., has announced the election of Russell W. Wetjen as Vice President and General Manager.

Before he became associated with Buffalo Meter Company in 1958, Mr. Wetjen was sales manager of the Petroleum & Industrial Division of Neptune Meter Company. Previously he was President of the Perfect Propane Gas Company, Inc., Hawley, Pa.

## Jeffrey Names Regional Managers

The Industrial Division of the Jeffrey Manufacturing Company, Columbus, Ohio, has realigned its field office operations and announced the appointment of four Regional Sales Managers and five District Managers.

William K. Myers, formerly New York District Manager, has been named Regional Sales Manager—Eastern Region. In his new position, Myers will coordinate the field activities of the Boston, Buffalo, New York and Philadelphia district offices. Replacing Myers as Manager of the New York office is Paul Lawall. Formerly at New York as manager, Lawall was most recently Manager, Field Offices at Columbus.

Named Regional Sales Manager—East Central Region, is Howard S. Davies. He previously managed the Pittsburgh office.

Elmer F. Longnecker becomes Regional Sales Manager—Central Region. Most recently District Manager at Detroit, Longnecker will coordinate operations of the Chicago, Detroit, Milwaukee and St. Louis trading areas. Promoted to District Manager, Detroit, is William W. Etchberger.

The Duluth territory will be incorporated under the jurisdiction of the Milwaukee Office as Carl C. Verhine, formerly of Duluth, joins the Chicago office as a sales engineer.

The appointment of Vernon L. Ekblad as Regional Sales Manager—Southern Region, completes the list of new regional assignments. Formerly District Manager at Houston, Ekblad assumes responsibility for the over-all operations of the Birmingham, Houston and Jacksonville offices.

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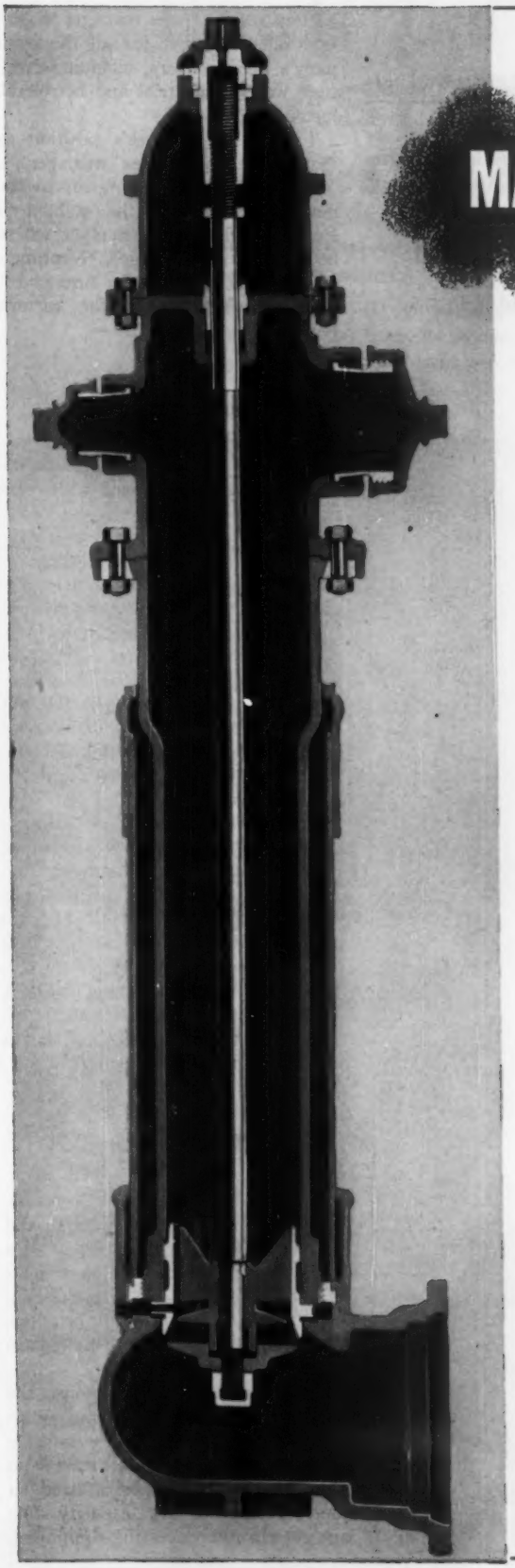


# MATHEWS HYDRANTS

**THE MATHEWS MODERNIZED HYDRANT SUPPLIES THE 4 FUNDAMENTAL REQUIREMENTS FOR EFFECTIVE COMMUNITY PROTECTION**

**and many other quality features, too**

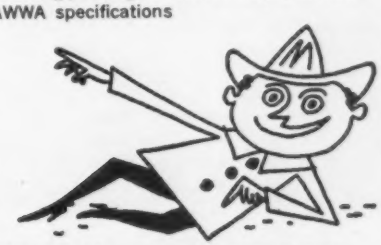
Replaceable barrel for maximum efficiency—quickly replaced in case of accident without excavating

Head revolves 360°; simply loosen bolts and rotate

Stuffing box plate cast integrally with nozzle section—eliminates extra part and provides positive, leakproof construction

Operating thread, protected by stuffing box plate, operates free of rust, sediment and ice

Also . . . Nozzle sections supplied with hose or pumper outlets as specified • Operating thread cannot be bent • Compression-type main valve prevents broken Mathews from leaking • Nozzle level can be raised or lowered without excavating • Bell, mechanical-joint, or flange-type pipe connections • Conventional or "O" ring packings • Meet all requirements of AWWA specifications



**Made by**

**R. D. WOOD COMPANY**

Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

# News of Suppliers

CONTINUED FROM PAGE 108A

## Behm Joins Stuart Corp.

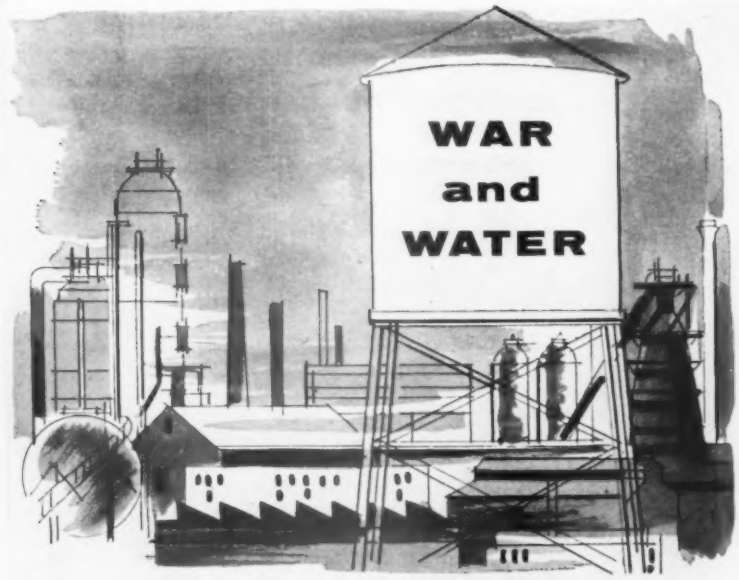
Stuart Corporation, Baltimore, Md., has announced that Mr. John T. Behm has joined their Sales Engineering Department.

Mr. Behm was formerly with Whitman, Requardt & Associates in Baltimore, Md. Mr. Behm will be located in the general offices of Stuart Corporation at 516 North Charles St., Baltimore 1, Md. and will be handling their products in the States of Maryland, Virginia and Delaware.

## Krause, Judge Promoted by Neptune

Neptune Meter Company, New York, N. Y., has announced the promotion of Charles W. Krause from eastern regional sales manager to general sales manager for all the company's liquid meters, including Neptune water, industrial and petroleum meters.

Filling Mr. Krause's position as eastern regional sales manager is James C. Judge, who moves to the new position from the company's Portland, Oregon branch office, where he was district manager. Neptune's Philadelphia and Boston branch offices are included in the eastern region.

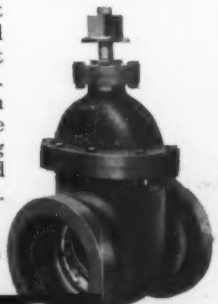

Domestic uses amount to only about 3% of U. S. annual water consumption.

During "cold" war maneuvers and real war rumors, it is well to remember that industrial water is a basic resource in national preparedness and in war. Entirely apart from human needs, without industrial water supply there could be little or no production of war materials.

Industrial production requires over 5 billion gallons of water daily. Inadequate water supply could cripple or kill industrial operations as they can knock out a man. The basic materials used to make aircraft may be metals, but the metals themselves could not be produced without the use of water. It takes 150 tons of water to make 1 ton of steel.

When you see a military airplane soar through the air, or read of the latest missile shot to the moon—remember that behind the scenes, unsung and perhaps unknown, were the engineers and management of a modern water works system.

*This Series is an attempt to put into words some appreciation of the water works men of the United States.*



M&H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

SUBSIDIARY OF W WALWORTH


## Milton Roy Adds pH Equipment to Line

Milton Roy Company, Philadelphia, Pa., has announced a 10-year license agreement between the Philadelphia firm and Electronic Instruments Limited, Richmond, Surrey, England, for the sale and manufacture of industrial and laboratory pH equipment in the United States.

The exclusive license agreement with EIL also includes EIL's laboratory titrating equipment, portable pH meters, glass electrodes, Titromatic analyzers, direct reading fluorimeters, sulfur dioxide gas analyzers and Vibron electrometers.

The EIL industrial pH instruments have fully automatic temperature compensation over a range of 0 to 100 C and are stable within 0.02 pH units over 24 hours and 0.1 pH units indefinitely. Discrimination is $\pm 0.02$ pH and their accuracy is $\pm 0.05$ pH. The laboratory pH meter using a Vibron electrometer will read pH directly to 0.002 pH units and has a full 5-inch scale deflection of 0.1 pH.

## Chicago Bridge Expands Houston Plant

Chicago Bridge & Iron Company, Chicago, has announced plans to add a 100-by-500 foot building and a "pickling" facility to its plant near Houston, Texas. A CB&I spokesman said this construction would complete a $1,000,000 expansion program started two years ago.

The new building will house the plant's fabricating and erecting equipment. The pickling facility will be used to remove excess mill scale from steel plates and shapes utilized in the fabrication of large capacity storage vessels and processing equipment.

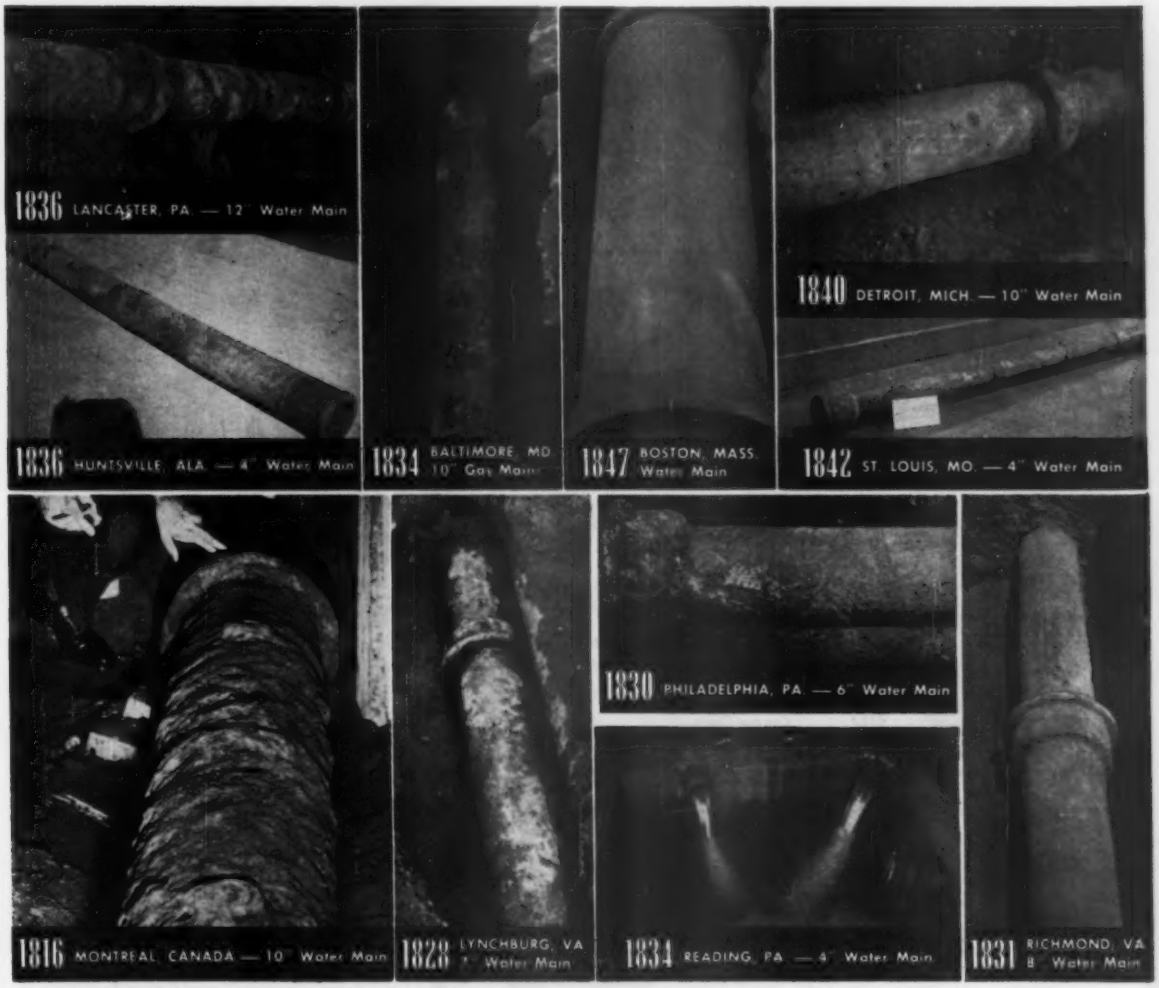
# Here Is "Ordinary Rustable"

# CAST IRON PIPE

## *In Service for a Century or More*

It has been stated by some companies manufacturing pipe that is allegedly competitive with cast iron that "ordinary cast iron pipe is rustable."

The fact is that cast iron pipe takes on a protective coating of oxidation, which preserves the body of the pipe for a century or longer. Pictured here are a few of more than 100 American installations of cast iron pipe that have been in service in water and gas mains for 100 years or more.


1836 LANCASTER, PA. — 12" Water Main
1836 HUNTSVILLE, ALA. — 4" Water Main
1834 BALTIMORE, MD. 10" Gas Main
1847 BOSTON, MASS. Water Main
1840 DETROIT, MICH. — 10" Water Main
1842 ST. LOUIS, MO. — 4" Water Main
1816 MONTREAL, CANADA — 10" Water Main
1828 LYNCHBURG, VA. 7" Water Main
1830 PHILADELPHIA, PA. — 6" Water Main
1834 READING, PA. — 4" Water Main
1831 RICHMOND, VA. 8" Water Main

*This advertisement is published by Woodward Iron Company, Woodward, Ala., in the interests of the Cast Iron Pipe industry, which it has long been privileged to serve with quality iron from which quality cast iron pipe is made.*

**WOODWARD IRON COMPANY**

Since 1882

WOODWARD, ALABAMA

# New Bulletins

AVAILABLE FREE

## Steel Pipe Joint

911

Kaiser Steel Corporation, Oakland, Calif., has just released a new booklet describing a faster and more economical method of joining large diameter steel water pipe, by employing a rubber gasket joint instead of field welding. The unique joint was developed by engineers at the company's Fontana, Calif. Fabricating Division plant which manufactures large diameter steel and steel reinforced concrete pipe used in water and distribution systems.

The booklet describes how the joint can be used in coupling pipe ranging from 36 inches to 120 inches in diameter or larger. The joints permit rapid installation in the field and provide a watertight coupling which will give unlimited years of service without maintenance.

Included in the pamphlet are cross section drawings of the joint, specifications and details on how pipe sections employing the joint are installed.

## Filter Plants

912

General Filter Company, Ames, Iowa has available a new three-color bulletin describing Filter Plants for removal of iron, manganese, taste, odor and gas. Four basic treatment methods are completely explained. The problems are stated and the answers given.

## Ductile Iron Gate Valves

913

Ohio Injector Co., Wadsworth, Ohio has just released an 8-page brochure covering a new line of gate valves designed specifically for Ductile Iron.

The new valve line which will be known as the Pipe-Pal Series introduces an innovation described as "the spread flange design" which features a high visibility bonnet joint and extra long bolts for storage of bolting energy.

In addition to listing complete specifications, pressure-temperature ratings, and dimension and material charts, the folder describes newly developed applications for the Ductile Iron lines. Included also is a discussion of the engineering properties of Ductile Iron and micro-structure comparisons with gray iron.

## Expanded Line of Plastic Dall Flow Tubes

914

Builders-Providence, Div. B-I-F Industries, Inc., Providence, R. I., recently announced a new four page bulletin describing their expanded line of Builders-Providence Insert-Type Plastic Dall Flow Tubes for primary flow metering. The line now includes thirteen tube sizes between 4" and 48" as stocked items.

According to the bulletin the tubes are designed for easy installation between pipe flanges and is adaptable to Industrial and chemical uses, to Process Industries, Water and Sewage—wherever acids, alkalies, slurries and gases require accurate metering.

The two color bulletin contains descriptive text, dimension drawings

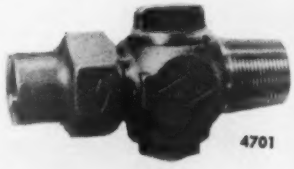
CONTINUED ON PAGE 114A


McDONALD / FOR OVER 100 YEARS

THE QUALITY NAME IN WATER WORKS BRASS GOODS

CORPORATION STOPS

4701 — With Straight Coupling Nut. (No Gasket).
Inlet: A.W.W.A. Corporation Stop Thread.
Outlet: Standard A.W.W.A. Thread for Copper Service Pipe.
Sizes: ½", ⅝" x ¾", ¾", 1", 1¼", 1½", 2".


4701

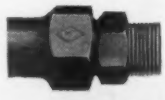
CURB STOPS – ROUND WAY – INVERTED KEY – COMBINED CAP AND TEE – WITH CHECK

4713

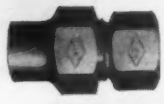
4713 — Stop
4714 — Stop and Drain. (Not Illustrated).
Inlet: A.W.W.A. Thread for Flared Copper Tube.
Outlet: A.W.W.A. Thread for Flared Copper Tube.
Sizes: ½", ¾", 1", 1¼", 1½", 2".

COPPER SERVICE PIPE FITTINGS

4753 — Straight Coupling.
Copper to Outside Iron Pipe Thread.
Sizes: ½", ⅝" x ¾", ¾", 1", 1¼", 1½", 2".


4753

4754 — Straight Coupling.
Copper to Inside Iron Pipe Thread.
Sizes: ½", ¾", 1", 1¼", 1½", 2".

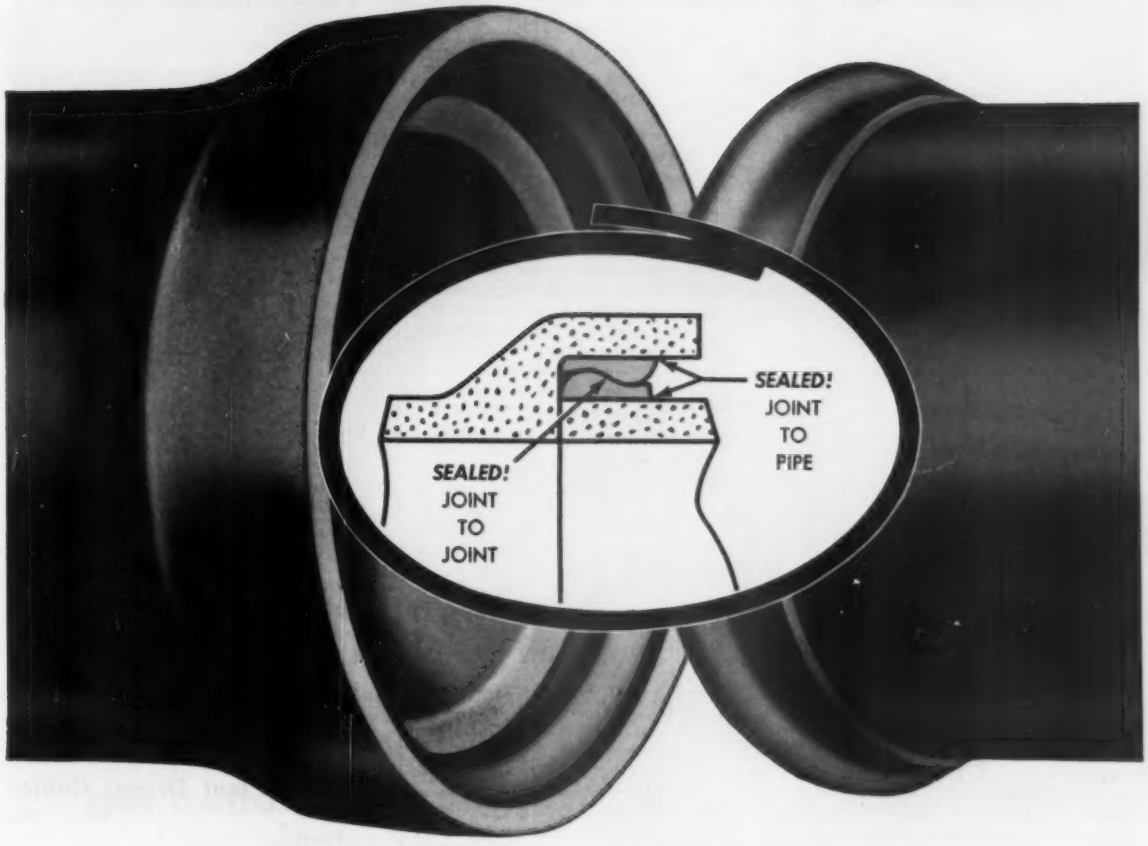

4754

For information on McDonald's complete line of quality Water Works Brass goods, write to:

A. Y. McDONALD MFG. CO.
Dept. WSW-959, 12th & Pine Sts. Dubuque, Iowa

# Wedge-Lock®

## HANDLES INFILTRATION!




### ROOT-TIGHT SEAL!

Patented Wedge-Lock Joints are bonded to Vitrified Clay Pipe—*at the factory*—to bring you the highest performance standards . . . the lowest installation costs.

One simple, easy operation and the joint's tightly sealed around the full pipe circumference . . . stays in continuous compression for the life of the pipe. When you specify Wedge-Lock, you reduce infiltration and resist root problems before they start . . . keep installation costs down . . . benefit from the guaranteed performance of the world's longest-lasting pipe.

### MINIMUM INFILTRATION!

*Write to listed manufacturers for literature or an actual Wedge-Lock demonstration*

## Wedge-Lock CLAY PIPE

**THE FACTORY-JOINTED CLAY PIPE AVAILABLE NATIONALLY FROM LOCAL MANUFACTURERS**

Order Wedge-Lock from any of these Vitrified Clay Pipe Manufacturers:

**Cannelton Sewer Pipe Company**..Cannelton, Ind.
**The Clay City Pipe Company**....Uhrichsville, Ohio
**The Evans Pipe Company**.....Uhrichsville, Ohio
**Graff-Kittanning Clay Products**..Worthington, Pa.
**Larson Clay Pipe Company**.....Detroit, Mich.
**The Logan Clay Products Company**..Logan, Ohio
**The Robinson Clay Product Co.**.....Akron, Ohio
**The Stillwater Clay Products Co.**..Cleveland, Ohio
**Superior Clay Corporation**.....Uhrichsville, Ohio

WLC-159-186-A

# New Bulletins

CONTINUED FROM PAGE 112A

and tables, a cutaway view showing design features, a chart showing comparison of pumping costs, graphs showing efficient recovery characters as compared to other differential producers, and a listing of the different construction combinations available.

## Diaphragm Control Valve

915

OPW-Jordan, Cincinnati, Ohio, has released a new 8-page, diaphragm control valve bulletin that describes Sliding Gate and Plate Control Valves.

Complete engineering data, cutaway drawings, features, application information, dimensional drawings, flow capacities, rating charts, flow curve and sample specifications shown. OPW-Jordan Diaphragm Control Valves are used with steam-water-air-oil-gas and chemicals wherever accurate regulation, tight shut off and minimum maintenance are desired in control valves. The self cleaning, self lapping control valves are available in ¼"- 6" sizes from stock.

## Water, Sewage and Industrial Water Treatment Equipment

916

Link-Belt Co., Chicago, Ill. has available a book on Water, Sewage and Industrial Waste Treatment Equipment. This new 20-page book contains illustrations and photographs of the latest sanitary engineering equipment and also shows flow diagrams of how this equipment can be installed in typical water, sewage and industrial waste treatment plants.

Standard equipment described includes six types of screens, three types of Straightline mixers, Straightline grit collectors and grit washers, and both the Straightline and Circuline sludge collectors.

Additional equipment for specific requirements includes motor-driven scum skimmers, Roto-line scum pipes, Link-Belt traveling bridge sludge collectors and a motor driven transversing bridge, with belt conveyor, for the removal of sludge from sludge drying beds. Special designs, where standard equipment has to meet particular operating conditions, are also illustrated and described.

## Sewage Plant Design Guides

917

Portland Cement Association, Chicago, Ill., has just published an 8-page charted summary entitled "Sewage Treatment Plant Design Guides". This summary is published as a service to the sanitary engineering profession for the purpose of making the information readily available for reference use, comparison and improvement. The information contained therein was obtained from state water pollution control agencies.

## Trenchers

918

The Cleveland Trencher Co., Cleveland, Ohio, has just published a four-page folder on the three new Cleveland "J" trenchers introduced earlier this year. Text of the folder, aided by a series of simplified mechanical illustrations, describes the new design and construction features in terms of

CONTINUED ON PAGE 116A

FORT LAUDERDALE • ST. PETERSBURG • FORT MYERS • NAPLES • GAINESVILLE • "MARINELAND" (ST. AUGUSTINE)
WEST POINT • MARION • JACKSONVILLE • EVANSTON • MOLINE • GRANITE CITY • VANDALIA • MATTOON • ALTON • FR
STREATOR • EAST ST. LOUIS • WILLIAMSON COUNTY • INDIANAPOLIS • BEDFORD • GENERAL MOTORS (INDIANAPOL
RICHMOND • COUNCIL BLUFFS • CENTERVILLE • DAVENPORT • DUBUQUE • CRESTON • HUMESION • WEST DES MOINE
OSAGE CITY • BELOIT • GRENOLA • KANSAS CITY • ATCHISON • ELLSWORTH • MANHATTAN • HAYS • TOPEKA • OLAT
WICHITA • ALTAMONT • LAWRENCE • MORRIS • ST. PAUL • FT. SCOTT • EUREKA • DESOTO • LAWRENCE • RUBBER RES
PRINCETON • OWENSBORO • HOPKINSVILLE • LEXINGTON • U.S. ARMY (FORT CAMPBELL) • JEFFERSON COUNTY •
BELLE CHASSE • LAKE CHARLES • SHREVEPORT (CROSS LAKE PLANT) • ALEXANDRIA • EMPIRE • KAISER ALUMINUM
KAISER ALUMINUM CO. (CHALMETTE) • SHREVEPORT • MARRERO • LOGANSPORT
BEL AIR • HAVRE DE GRACE • WESTMINISTER • YPSILANTI • FILER
WYANDOTTE • ALGONAC • HIGHLAND PARK • FAIRMON
VICKSBURG • JACKSON • MARSHA • PLAT
EXCELSIOR SPRINGS • RICHMOND •
IRONTON • CAR • GREAT FALLS •
LINCOLN • O • TON
FREDONIA • FORD • LILL
CORNING • A • FIN • AVON L
WINDHAM • ELYRIA •
McALESTER • DURANT
WILKINSBUR • HOME (EVA
FREDERICKT • ALIQUI
READING • GU
CARMICHAEL
HILLMAN CO
NEW KENSI
LETTERKENNY
BEAVER FALLS • MA
EVANS CITY • TARENTU
SEVIERVILLE • FRAYSER • CH
BORGER • NAVY BASE, (CORPUS
PHARR • MONTE ALTO • BROWNSVILLE • DONNA • SAN ANGELO • BEAUMONT • FORT WORTH • LLANA • MARSHALL •
ELECTRA • SWEETWATER • WICHITA FALLS • WESLACO • IOWA PARK • ABILENE • PORT ARTHUR • SAN BEN
HOUSTON • STAMFORD • RIVER OAKS • WACO • RIO GRANDE CITY • GULF OIL CORP. (WEST PORT ARTHUR) •
EAGLE PASS • PHILLIPS CHEMICAL CO. (HOUSTON) • ALBANY • WEATHERFORD • INDUSTRIAL FILTER CO. (HOUSTO
IOWA PARK • NORFOLK • PORTSMOUTH • AMERICAN VISCOSE CORP. (FREDERICKSBURG) • AMERICAN VISCOSE
NEWPORT NEWS • WHEELING • MATEWAN • CHARLESTON • WEIRTON • AMHERST COAL CO. (LUNDSDALE) • MT. HO
MOOREFIELD • LOGAN • MONONGAH • RICHWOOD • FAIRMONT • KINGWOOD • NORTH FORK • PHILLIPI • NITRO • RIPLE

**Again on the growing Leopold list... PHILADELPHIA**

*For New Projects...*

**PHILADELPHIA AGAIN CHOOSES LEOPOLD**

**In addition to the Belmont Plant, where they were installed for rehabilitation ten years ago, Leopold Glazed Tile Filter Bottoms were chosen for Philadelphia's new facilities.**

The two latest projects, involving the new Torresdale Plant (maximum capacity, 423 M.G.D.) and the reconstruction of the existing Queen Lane Plant filters (maximum capacity, 150 M.G.D.) both used Leopold bottoms throughout.

Made of de-aired fire clay—vitrified and salt glazed, the Leopold filter bottom can't be matched for dependable, economic service. Individual Leopold blocks can't corrode or absorb water . . . are acid and alkali resistant . . . not subject to tuberculation . . . provide equal filtration and uniform wash distribution. For modernization or new construction, consider the long term economy and performance offered only by Leopold filter bottoms. **Write today for complete information.**

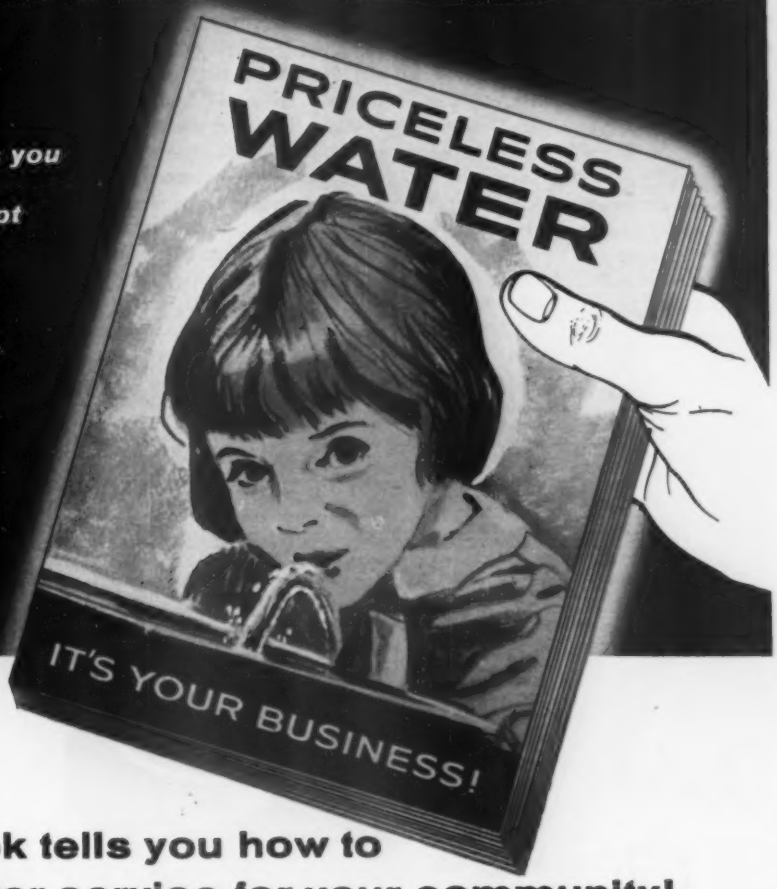
**F. B. LEOPOLD CO., INC.**
ZELIENOPLE, PA.
*Exclusive Canadian Representative: W. J. Westaway, Ltd., Hamilton, Ont.*

Leopold

**GLAZED TILE FILTER BOTTOMS**

DIRECTLY SUPPORTING THE INDUSTRY'S ADVANCEMENT PROGRAM

*Johns-Manville brings you an entirely new concept of evaluating your community's needs . . .*




# NEW!

## 84-page book tells you how to get better water service for your community!

**Gives unique step-by-step method for water service evaluation and trouble-spotting.**

**Uses case histories to show how improved water service can benefit your community.**

**Tells how to make your community want—and approve—water system improvements.**

"PRICELESS WATER . . . it's your business" is written expressly for water utility managers, engineers, public officials—all those business and community leaders who are alert to the basic contribution good water makes to the life and economic well-being of a community.

The result of months of study, planning and research—"PRICELESS WATER" is edited in four sections:

***Section One,* "How good water service benefits your community,"** gives you needed "ammunition" to convince the most skeptical of the many advantages of good water service. It shows how improved water service affects property values and insurance rates. How an efficient water system will attract business. How a poor system turns it away! This section tells how entire communities have benefited by water improvements.

***Section Two,* "How to evaluate your water system,"** is edited for water and town planning officials. It is a new, step-by-step method for water service evaluation. It shows how you can quickly and easily evaluate the efficiency of everything from community water supply, treatment and distribution to metering, staff facilities and operations.

***Section Three,* "How to turn evaluation into improved water service,"** tells when a preliminary engineering survey is needed. When and how to retain a consulting engineer. How to use his report as a springboard for action. Fiscal agents, and when and how to use them. Also contains a helpful explanation of various financing methods.

***Section Four,* "Arousing the public to action,"** is an easy-to-follow, success-proven handbook on public relations. It tells how a soundly conceived PR program can sell your community on water service.

In short, "PRICELESS WATER" is the hard-hitting tool you need to get your community the improved water service it needs. Send the coupon for your free copy, now!

JM PRODUCTS

**JOHNS-MANVILLE**
BOX 14 WS, NEW YORK 16, N. Y.

Please send me without obligation a copy of the new 84-page water advancement brochure "PRICELESS WATER . . . it's your business."

Name_____ Title_____

Address_____

City_____ Zone____ State_____

# New Bulletins

CONTINUED FROM PAGE 114A

how they improve the operation of the trenchers.

According to the folder, all three new models have a revolutionary new-type, V shaped discharge conveyor which is driven, shifted and reversed in direction of discharge by independent hydraulic drives lever-controlled from the operator's seat. Their full crawlers have new-type non-packing, anti-friction-bearing-mounted tracks, dual support and drive on both ends of crawler pins, and big 16" x 3" hydraulic steering brakes. The new machines also have all control levers grouped for utmost safety and convenience, with all operations easily controlled from the operator's seat.

A quick, convenient comparison of the digging capacities, specifications and dimensions of the three new "J" models is provided on page 4 of the folder. Action photos show the "J" trenchers working in typical job conditions.

Another AERO-ACCELATOR® plant

*The ideal sewage treatment plant for small communities, motels, industrial plants and institutions.*

**installed for Summit Park Sanitorium**

The Summit Park Sanitorium at Pomona, New York, has installed another "AERO-ACCELATOR" activated sludge plant to handle its increased need for sewage treatment. The selection was based on five years performance of the first unit with consistently good treatment, and low operating and maintenance costs.

This type of plant will provide 90-95% B.O.D. and suspended solids removal. As a *plus* value, it will afford substantial savings in space and in the cost of installation because of its compact design.

"AERO-ACCELATOR" plants, described in Bulletin 6510, can be custom-designed for all municipal and industrial requirements regardless of capacity. It will pay you to investigate.

**SEE YOUR CONSULTING ENGINEER** if you are planning *any* installation. His services are essential for the design of the plant and selection of equipment that will best meet your requirements.

INFILCO Inc., General Offices • Tucson, Arizona
*Field offices throughout the United States and in other countries*

INFILCO

971


## Automatic Colorimetric Analyzers

919

Milton Roy Company, Philadelphia, Pa. has published a bulletin on Quantichem Automatic Colorimetric Analyzers.

The bulletin describes the industrial instruments available for colorimetric determinations of trace quantities of substances dissolved in liquid process streams. It specifically gives details on analyzers for dissolved silica, dissolved oxygen and total water hardness. Schematic diagrams are included as well as descriptions of the pneumatic programmer, unique sample cells and devices for measuring reagent.

## Rubber Waterstop

920

Presstite Division, American-Marietta Company, St. Louis, Mo., has just published an illustrated booklet on a rubber waterstop called Aquastop.

The literature describes a product that has been engineered in both material and design to provide watertightness in concrete expansion, contraction and construction joints—even under hydrostatic pressure. Other product characteristics such as tensile strength, flexibility and elasticity are also described.

The several available styles of Aquastop are shown, along with a listing of sizes and illustrations of typical applications.

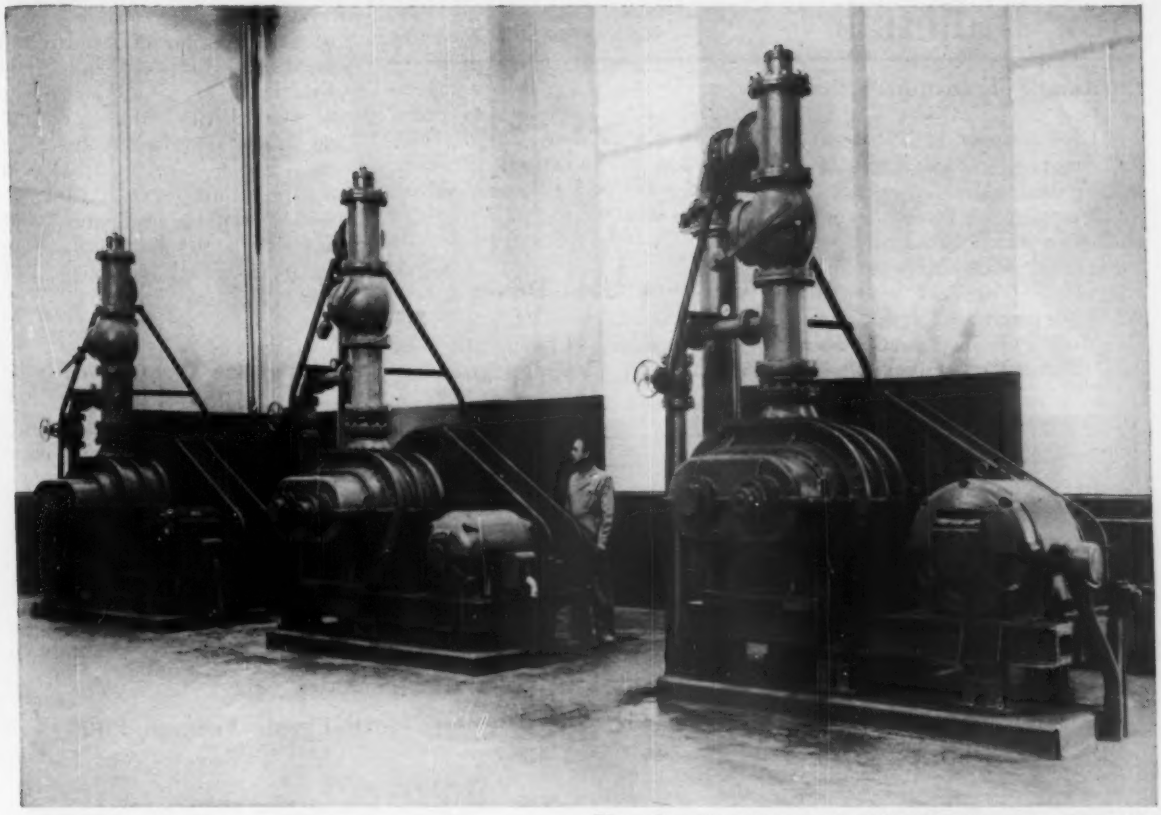
Included, too, is "how-to" information on the field-splicing of AQUASTOP (such molded accessories as tees, unions, crosses, and ells are shown), as well as standard specification information that covers materials, installation requirements, sampling and testing.

## Gratings

921

Blaw-Knox Co., Pittsburgh, Pa., has available a booklet that discusses the safety, visibility, permanence, and easy maintenance advantages of open flooring for industrial and public works applications.

CONTINUED ON PAGE 118A



These three 18 x 18 heavy duty Sutorbilt blowers operate at 350 rpm, deliver 2400 cfm against 7 psig . . . operate continuously for many, trouble-free years. San Jose Sewage Treatment Plant.

# SUTORBILT BLOWERS MINIMIZE AIR CONTAMINATION

You can depend on Sutorbilt Positive-Pressure Blowers and Gas Pumps to deliver clean, dry air or gas for many years, without costly maintenance and loss in efficiency. Reasons include precision-machined, wide-face herringbone gears, extra-rugged exclusive Sutorbilt timing hub, heavy-duty anti-friction roller bearings . . . closely-held tolerances throughout. Grease and oil seals, or in some instances, a five ring packing gland, insure integrity of air seal where shaft passes through the blower headplate.

***Write for illustrated brochure giving complete specifications.***

Representatives located in principal cities. Consult your classified telephone directory.

FULLER COMPANY GENERAL AMERICAN TRADE MARK

SUTORBILT IS WELL BUILT

**CORPORATION, 2966 East Victoria St. • Compton, Calif.**

Subsidiary of Fuller Company, Catasauqua, Pa.

ROTARY POSITIVE-PRESSURE BLOWERS AND GAS PUMPS WITH VERTICAL OR HORIZONTAL MOUNTING

1184
8-11

# New Bulletins

CONTINUED FROM PAGE 116A

## Pneumatic Transmitter

922

B-I-F Industries, Inc., Providence, R. I., has published a new bulletin describing the Builders-Providence BalanCel, a pneumatic transmitter which produces a change in output pressure proportional to a change in differential loading pressure within one-half of one percent of full scale range. The Model AT-SD BalanCel Pneumatic Transmitter is specifically designed for the water, sewage and industrial fields for accurately transmitting rate of flow, loss of head, liquid level measurements, etc. over distances to operate meters, valves, controls, etc.

## Gear and Fluid Drives

923

Link-Belt Co., Chicago, Ill. has just compiled a 48-page book that presents information on one of the most extensive line of standardized Gearmotors, Motogears and Fluid Drives available to industry. The book "Gearmotors, Motogears and Fluid Drives" describes the functions of these various types of drives and provides detailed selection data, dimensions, overhung load ratings and mountings. It also lists such accessories as couplings, backstops and slide rails.

## Small Sewage Treatment Plant

924

Walker Process Equipment, Inc., Aurora, Ill. has released a bulletin describing an entirely new small sewage treatment plant called Sparjair. According to the bulletin, these package type plants, range in size from as low as 50 pop. equiv. to 5000 and utilize the contact stabilization process to produce a clear, nuisance free effluent.

## All Plastic Vacuum Filter

925

B-I-F Industries, Inc., Providence, R. I., has released a new bulletin describing the new, all plastic Proportioneers Vacuum Filter of cylindrical construction for more efficient and more economical swimming pool filtration.

## Automated Water System

926

Femco, Inc., Irwin, Pa., has released a bulletin explaining a new simple and reliable monitoring, telemetering and remote control system for the water supply field.

## Tank Maintenance

927

Dixie Tank & Bridge Co., Memphis, Tenn., has available the latest copy of the company's quarterly booklet "Tank Talk."

## Water Testing Equipment

928

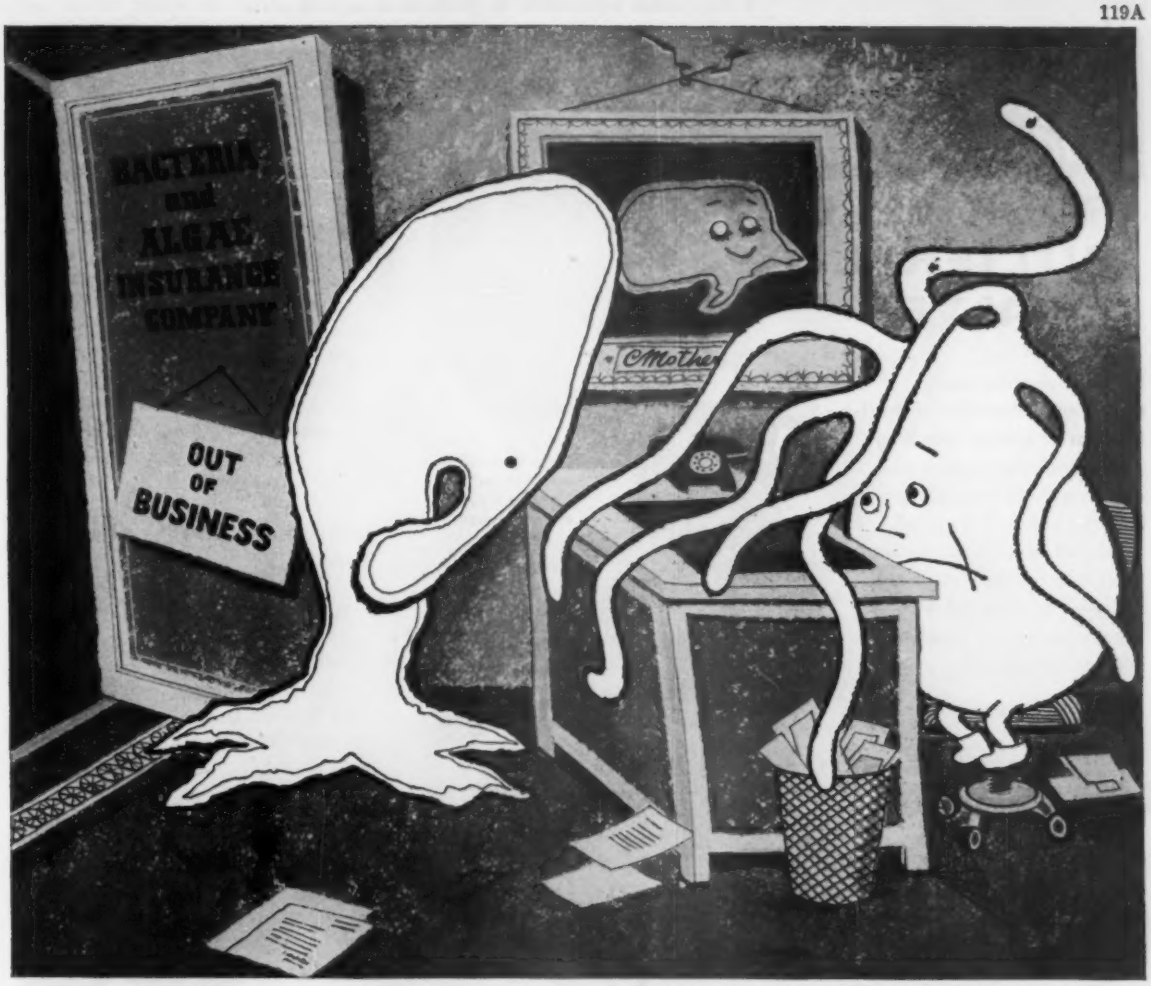
Hagan Chemicals & Controls, Inc., Pittsburgh, Pa., has just published a new bulletin describing equipment and reagents for fast, on-the-spot water testing.

CONTINUED ON PAGE 120A

1. Large illustration shows Singl-use Fiberform ready to be filled.
2. Filling plate and collar simplify pouring concrete into form.
3. Completed meter box barrel.
4. Meter box with cover in place.

FOR ECONOMICAL SETTINGS

Make Your Own
CONCRETE METER BOX BARRELS with FORD Singl-use Fiberforms
Water utilities that find vitrified or concrete tile expensive or difficult to obtain, may now make their own barrels for outside meter settings with Ford Singl-use Fiberforms which are inexpensive and easy to use. Forms made for 15", 18" and 20" ID barrels and in lengths of 15", 18" and 24". Use two for deep settings. Send for full information.
FOR BETTER WATER SERVICES
FORD
THE FORD METER BOX COMPANY, INC. Wabash, Indiana




# "Our business is busted, Orgie... we can't fight PITTCHLOR®!"

You're right, Algie. You haven't got a chance of holding onto customers because Pittchlor kills chlorine-susceptible bacteria and algae instantly. That's why it's such a big favorite of water works and sewage disposal plant operators.

Pittchlor kills such microorganisms on contact because it is a high-test calcium hypochlorite containing a minimum of 70% available chlorine. Its granular form provides quick chlorine release and permits easy application either manually or through mechanical feeders. In addition, you'll find it the perfect source for emergency and standby chlorination.

Dry, free-flowing Pittchlor provides economical chlorination of water supplies and sewage, helps in B.O.D. reduction, odor control, effluent disinfection, and is an aid to coagulation.

Pittchlor is highly stable and retains its chlorine strength when stored for reasonable periods.

Stock up on Pittchlor now. Just contact your nearest Columbia-Southern distributor today.

PITTCHLOR—Packaged in resealable cans, 5 lb. (9 per case) and 3¾ lb. (4 per carton). Also in 100 lb. drums.

**COLUMBIA-SOUTHERN CHEMICAL CORPORATION**

A Subsidiary of Pittsburgh Plate Glass Company · One Gateway Center, Pittsburgh 22, Pennsylvania

DISTRICT OFFICES: Cincinnati · Charlotte · Chicago · Cleveland · Boston · New York · St. Louis Minneapolis · New Orleans · Dallas · Houston · Pittsburgh · Philadelphia · San Francisco

IN CANADA: Standard Chemical Limited

for BEST CONTROL and SHUT-OFF

ROCKWELL BUTTERFLY VALVES

For manual or automatic regulation of flow and shut-off in water or sewage handling and distribution systems your most dependable source for butterfly valves is Rockwell. None can match it for available types and range of sizes and materials of construction. What's your valve problem? We can solve it.

*Large Rockwell motor-operated valve for throttling flow of raw sewage.*

*Standard Rockwell AWWA Specification butterfly valve with rubber seat insert for drop-tight shut-off.*

ROCKWELL SINCE 1888 BUILT

W. S. ROCKWELL COMPANY

Valves—Butterfly · Slide · Diaphragm · Special

2829 ELIOT STREET • FAIRFIELD, CONN.

GUNITE does it 2 times as fast at 1/2 the cost

"Gunite" is the modern process (sand and cement applied pneumatically) for repairing, constructing, lining:

- Reservoirs
- Dams
- Filter Plants
- Sewage Disposal Plants
- Tanks
- Stadiums
- Bridges
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# New Bulletins

CONTINUED FROM PAGE 118A

## Comparison of Coating Systems

929

The Carboline Company, St. Louis, Mo. has released a new four page chart "Comparison of Maintenance Coating Systems" designed to aid all engineers and maintenance personnel concerned with buying and specifying corrosion resistant maintenance protective coatings.

## Instrument and Control Panels

930

Bailey Meter Co., Cleveland, Ohio, has published a 16-page product Specification giving details of construction, dimensions, weights, instrument mounting, and accessories for six standard styles of instrument and control panels.

## Chemical Solution Feed Pump

931

Fischer & Porter Co., Hatboro, Pa., has released a new Specification Bulletin describing their chemical solution feed pump featuring a hydraulically balanced Teflon slack diaphragm not directly connected to plunger. Diaphragm is unconditionally guaranteed for the life of the pump.

## Steel Water Pipe

932

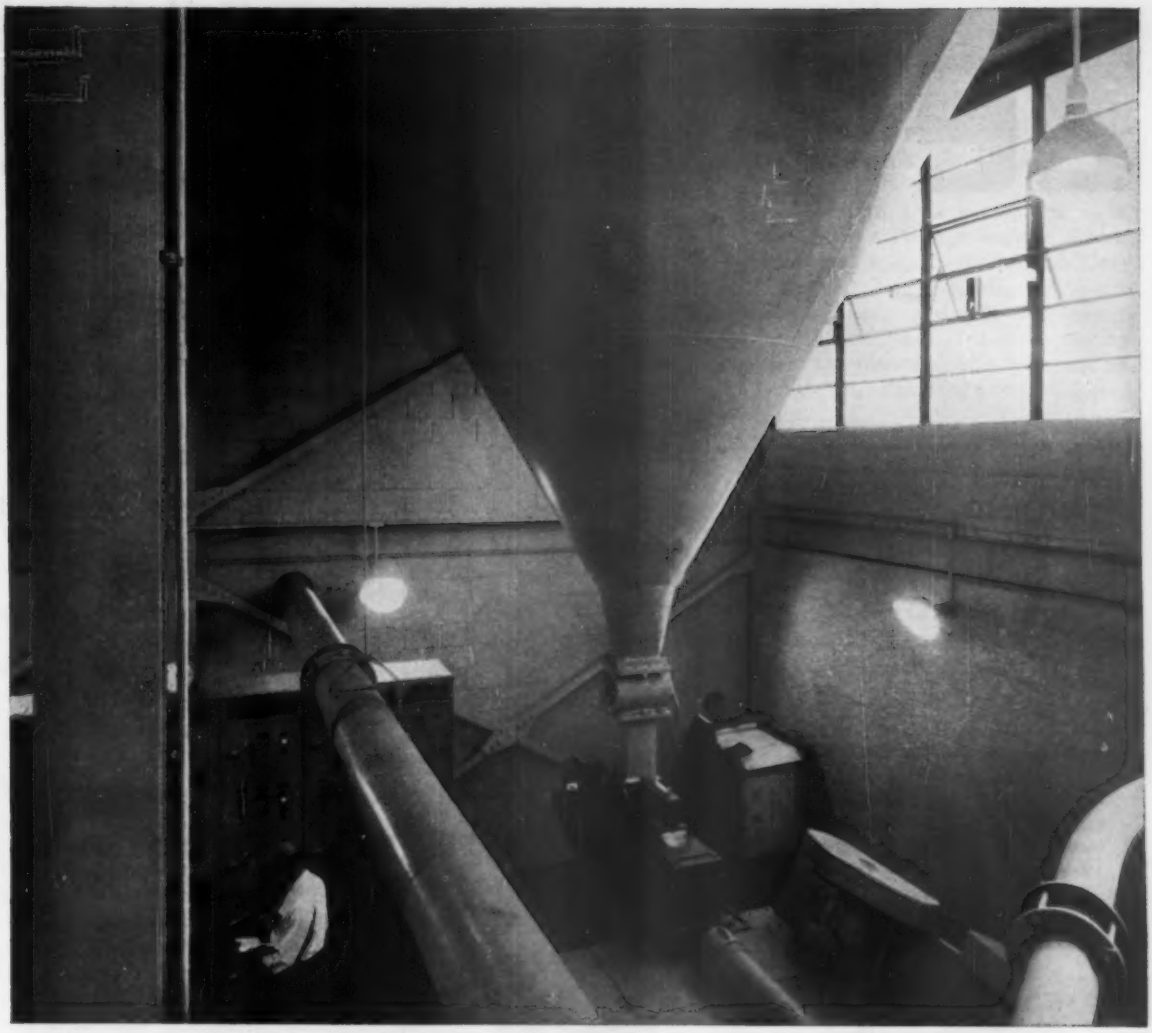
Armco Drainage & Metal Products, Inc., Middletown, Ohio has issued a new illustrated folder on its welded steel water pipe. Subjects treated are wide range of diameters and wall thicknesses; durability, rigid testing, lengths up to 50 ft; high flow capacity; high strength; and field fabrication.

## Torque-Flow Pump

933

Wemco, a Div. of Western Machinery Company, San Francisco, Calif. has announced the availability of a four page bulletin describing the varied industrial applications of its non-clog Torque-Flow Pump.

CONTINUED ON PAGE 123A



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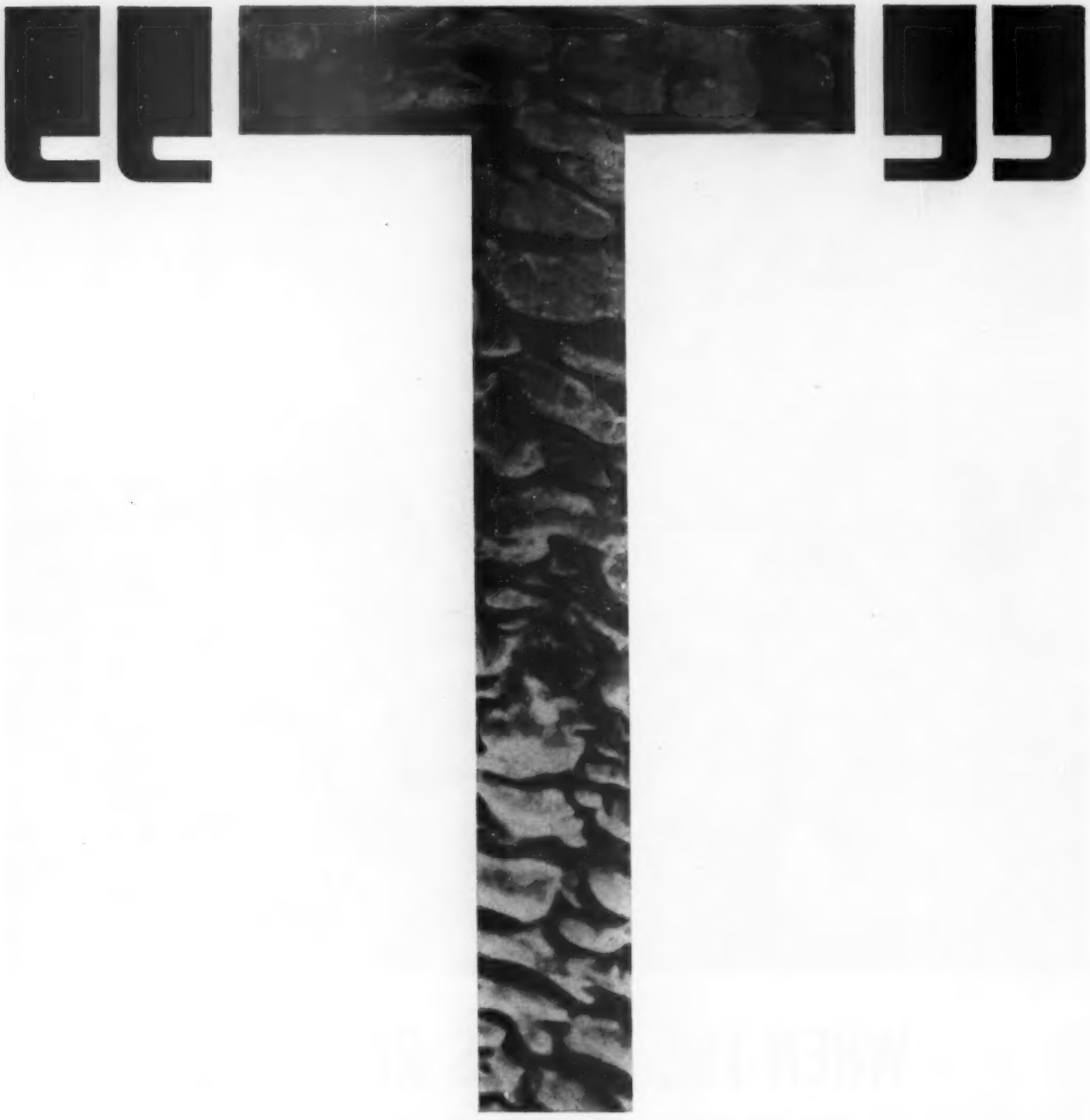

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# New Bulletins

CONTINUED FROM PAGE 120A

### Protective Coating

934

The Arco Company, Cleveland, Ohio, has just published a new booklet on Arco Dum Dum for Metal, a heavy protective coating.

### Low Pressure Compressors

935

Joy Manufacturing Co., Pittsburgh, Pa., has just published a new eight page bulletin covering the company's complete line of heavy duty, low pressure compressors.

### Fiberglass Filter Wash Troughs

936

B-I-F Industries, Inc., Providence, R. I., has just published a bulletin on fiberglass filter wash troughs that are maintenance-free, light weight, weather and sun resistant and easy to level.

### V Notch Weir Meter

937

Burgess-Manning Co., Penn Instruments Div., Philadelphia, Pa., has available a 4-page bulletin on the use of the Type ML Meter as applied to weir boxes for measurement of flow across 90° V Notch Weirs.

The bulletin presents an introduction to the new type meter, and lists the advantages of installation.

### C. B. & I. Services Booklet

938

Chicago Bridge & Iron Co., Chicago, Ill., has available a 4-page booklet entitled, "Creative Craftsmanship in Steel." The booklet describes the coordination engineering, fabrication and erection services offered by the company.

### Protective Coatings

939

The Carboline Company, St. Louis, Mo., has just issued a completely revised four page bulletin on protective coatings.

The bulletin gives a breakdown of the four classifications of corrosive conditions according to severity of exposure. Sketches of appropriate areas are shown in each grouping.

### Proportioning Pump

940

B-I-F Industries, Inc., Providence, R.I., has just published a new bulletin describing Proportioneers Model 1106 Adjust-O-Feeder designed for the accurate proportioning of general industrial fluids.

### Asbestos-Cement Pipe Film

941

The Asbestos-Cement Pipe Division of Keasbey & Mattison Company, Ambler, Pennsylvania has announced the availability of a new sound-color 16MM movie highlighting the manufacture, installation and advantages of asbestos-cement pipe.

### Filter Fabric Co. Lists Products & Services

942

TechFab, Inc., Nutley, N. J., has available an 8-page bulletin describing the products, facilities and services of this firm which offers a complete line of imported and domestic filter cloth, both yard goods and fabricated, filter specialty items and free filtration counseling and testing service.


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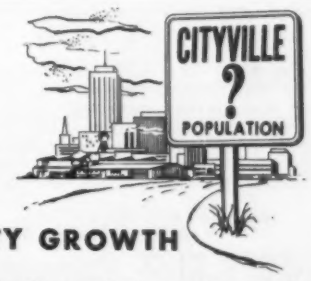


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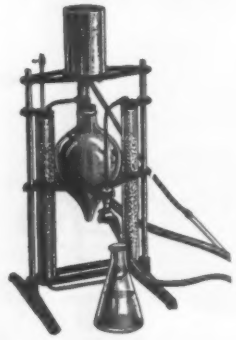

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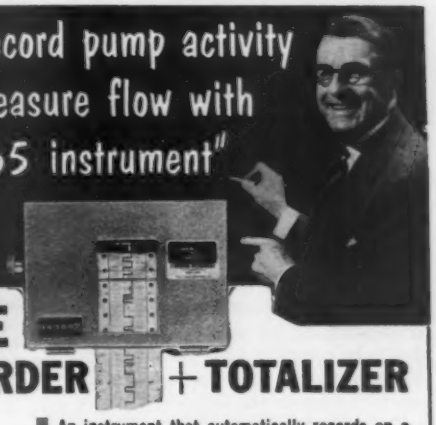

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## NEW CAST IRON PRESSURE PIPE PLANT FOR PLAINS STATES

### *Council Bluffs Location*

COUNCIL BLUFFS. Geographically located in the heart of the Plains States, the new pipe foundry of the Griffin Pipe Division, Griffin Wheel Company, is nearing completion at Council Bluffs, Iowa, reports Sam Prest, Vice President and General Manager. Shipments will reach their destinations in record time, because the site is served by eight major railroad carriers alone, in addition to truck carriers.

SAM PREST
*Vice President*

### *Economical 20-Ft. Length*

Pipe in 4- to 12-inch diameter sizes will be manufactured in accordance with American Standards Association, American Water Works Association, and Federal Specifications for water and gas distribution. The Griffin-20 trademark will apply to all pipe, which will be manufactured in modern 20-foot lengths. Griffin-20 pipe decreases the number of joints by 10 percent, as compared to conventional 18-foot lengths, with resultant savings in handling and installation.

### *Pipe Available March, 1960*

Installation of production facilities is proceeding on schedule, and is due to be completed in a few months. Modern automated machines will produce pipe by the Delavaud process of centrifugal casting in permanent water-cooled molds. Griffin-20 pipe joints will include slip-on, mechanical, and bell and plain end, and will be available for March, 1960 deliveries.

### *Operating 8 Foundries in Midwest*

Founded in 1877, Griffin operates 8 iron and steel foundries in the Midwest, two foundries on the west coast, and two in Canada. Also under construction is a new research center at Bensenville, Illinois. Griffin is a subsidiary of American Steel Foundries, which has 27 plants in 15 states and Canada.

# Advertisers Index


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American Hard Rubber Co. ..... 107A

**B**

Badger Meter Mfg. Co. ..... 10A
*B-I-F Industries, Inc. ..... 30A-31A-Back Cover
Buffalo Meter Co. ..... 2A
*Builders-Providence, Inc. ..... 30A-31A-Back Cover
Byers Co., A. M. ..... 5A

**C**

Calgon Co. ..... 122A
Cast Iron Pipe Research Ass'n. 33A-34A-35A
*Chain Belt Co. ..... 100A
*Chicago Bridge & Iron Co. ..... 4A
*Chicago Pump Co. ..... 1A-20A
Cleveland Trencher Co. ..... 23A
Clow & Sons, James B. ..... 14A-15A
*Columbia Southern Chem. Co. ..... 119A
*Combustion Engineering Co. ..... 26A-27A
Consulting Engineers ..... 125A-126A-127A

**D**

Darling Valve & Mfg. Co. ..... 12A
*Dorr-Oliver ..... Inside Back Cover

**E**

Eddy Valve Co. ..... 6A

**F**

Fischer & Porter Co. ..... 103A
Ford Meter Box Co. ..... 118A

**G**

Griffin Wheel Co. ..... 128A

**H**

*Hardinge Company, Inc. ..... 25A
Healy-Ruff Company ..... 124A
Hercules Powder Co. ..... 121A
Hersey Manufacturing Company ..... 22A
Hooker Chemical Sales ..... 94A

**I**

*Infilco Inc. ..... 116A
Industrial Chemical Sales ..... 8A

**J**

Johns-Manville ..... 115A

**K**

Keasbey & Mattison ..... 42A-43A
*Komline-Sanderson Engineering Corp. ..... 38A

**L**

Leopold & Co., F. B. ..... 114A
Leupold & Stevens ..... 13A
*Link-Belt Co. ..... 39A
Lock Joint Pipe Company ..... Inside Front Cover
*Ludlow Valve Mfg. Co., Inc. ..... 16A

**M**

McDonald Mfg. Co., A. Y. ..... 112A
*M & H Valve & Fittings Co. ..... 110A
Minneapolis-Honeywell ..... 99A
Mueller Co. ..... 41A-45A
*Multiplex Mfg. Co. ..... 19A

**N**

*Neptune Meter Company ..... 48A

**O**

O'Brien Mfg. Co. ..... 123A
Oliver Corp. ..... 93A

**P**

*Pacific Flush Tank Co. ..... 44A
*Pennsalt Chemicals Corp. ..... 24A
Phelps Dodge Refin. Corp. ..... 106A
*Phipps & Bird, Inc. ..... 124A
*Pressure Concrete Co. ..... 120A

**R**

*Roberts Filter Co. ..... 124A
Rockwell Mfg. Co. ..... 32A
Rockwell Mfg. Co. W. S. ..... 120A
Roots-Connersville Blower ..... 46A-47A

**S**

Schield Bantam Co. ..... 29A
*Simplex Valve & Meter Co. ..... 101A
Sparling Meter Co. ..... 28A
Standard Dry Wall Products, Inc. ..... 17A
Standard Instr. Corp. ..... 127A
Steel Plate Fabricators ..... 104A
Sutorbilt Corporation ..... 117A
Synchro-Start Products, Inc. ..... 127A

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*U. S. Pipe Fdry. Co. ..... 36A-37A

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Wood Co., R. D. ..... 109A
Woodward Iron Co. ..... 111A

**Y**

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*In water treatment, too . . .*

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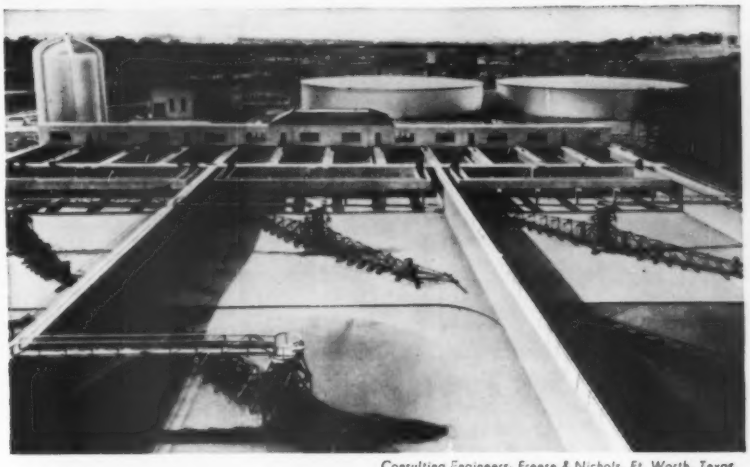

*Consulting Engineers: Freese & Nichols, Ft. Worth, Texas*
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## NOW FORT WORTH PROVIDES FOR DROUGHT PROTECTION

The 50 MGD South Holly plant provides Fort Worth, Texas, with one of the nation's most modern water treatment systems. It was recently constructed at a cost of $5,621,000. The plant is designed for future expansion, which can double its present capacity.

Interesting features of the installation are the six 124' 2" square Dorrco cross-flow Squarex Clarifiers for continuous sludge removal from three parallel rectangular sedimentation basins, shown in the photo above. Other plant components include a chemical building, two 6 MG clear wells and a high service pump station.

As in so many other water treatment facilities across the country, the engineers for this project realized maximum efficiency and economy of design in the wide choice offered by Dorr-Oliver equipment. For complete information, write for a copy of Bulletin No. 9141 to Dorr-Oliver Incorporated, Stamford, Conn.

*SQUAREX and DORRCO – T. M. Reg. U. S. Pat. Off.*

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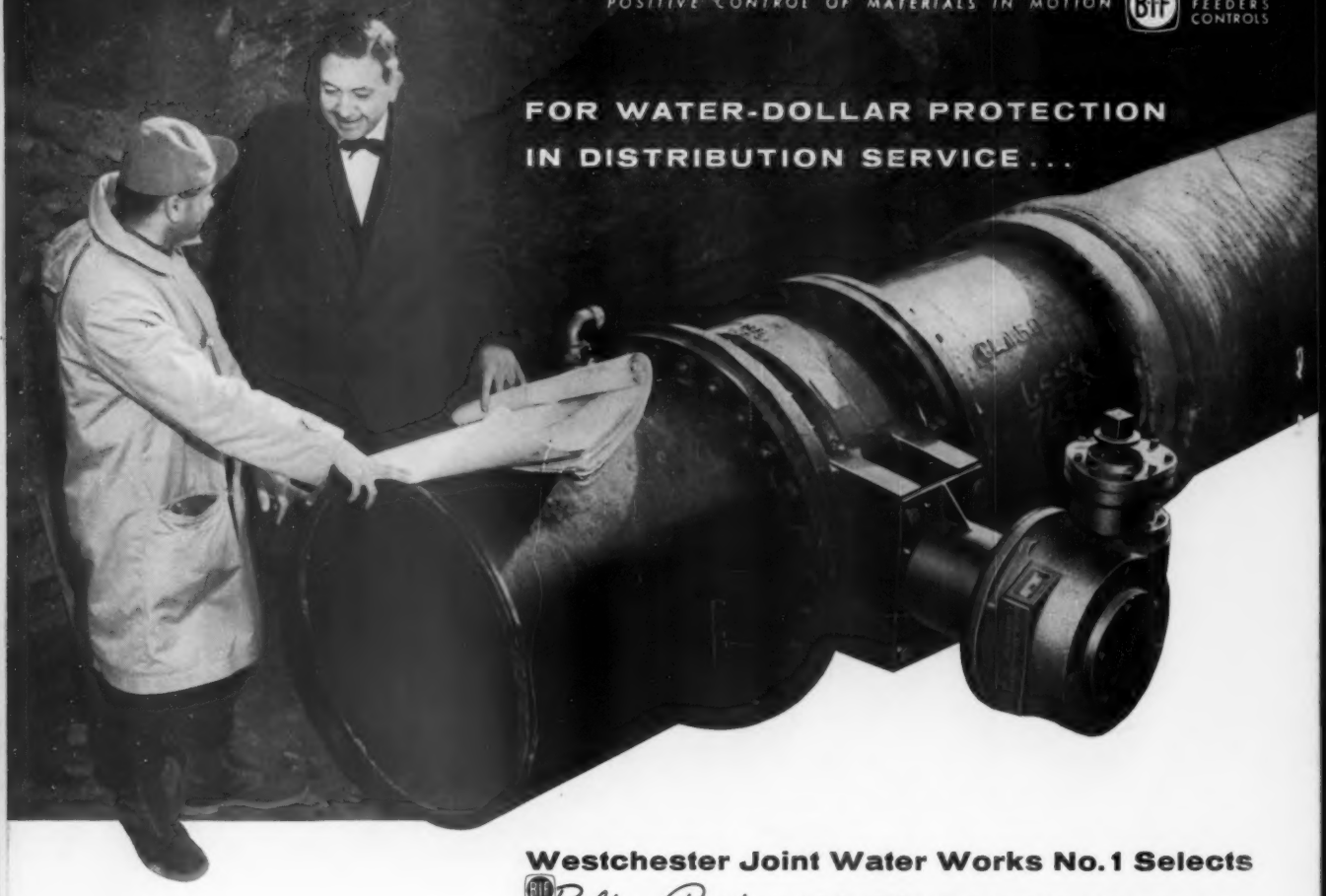


## Westchester Joint Water Works No. 1 Selects B·I·F Builders-Providence 125 PSI Butterfly Valves!

By standardizing on Builders Butterfly Valves for their new 30" transmission main, Westchester Joint Water Works No. 1, serving three Westchester County, N.Y. communities gets long-term protection on its water-dollar investment.

**Builders valves pay big dividends by:**

- protection against costly water loss due to wear after a few years service.
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- protection against frozen valves, broken shafts, shut-off failures . . . with resultant property damage, danger and delay.

**Builders valves meet or surpass A.W.W.A. Specifications:**

- *bubble-tight closures* . . . after thousands of operations.
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B-I-F Industries, offering nationwide sales and service through local offices, can save you time and money as your ONE SOURCE — ONE RESPONSIBILITY supplier of water works equipment. Write **B-I-F Industries, Inc., Dept. U, 350 Harris Avenue, Providence 1, R. I.**

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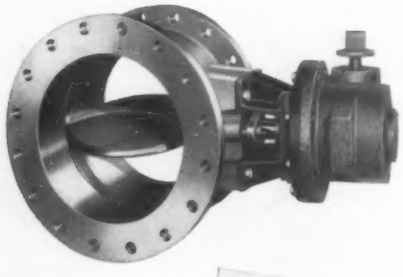

*Free Bulletin*

Bulletin 650.20-1 describes the many exclusive design features of Builders 125 psi Butterfly Valves.

B·I·F

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